

T.O. 5F8-5-41
(Formerly 05-20HD-1)

Handbook
Operation • Service
and
Overhaul Instruction
with Parts Catalog

DIRECTIONAL GYRO INDICATORS

AIR FORCE TYPE	PART NO.
C-1	657069
	661560
C-5	652191
	653290
	674174
C-5C	674090

(Sperry)

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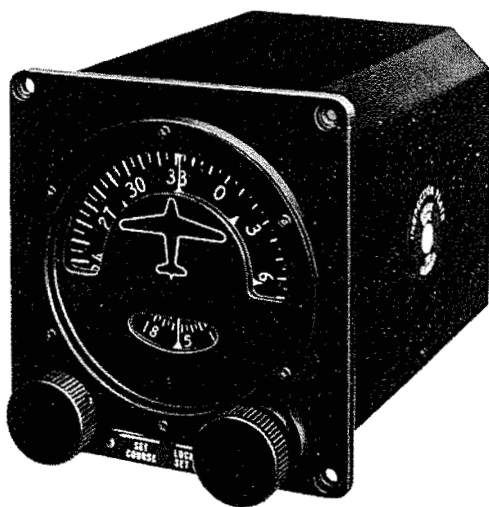


Figure 1 - Turn Indicator
(AF Type C-1, Sperry Part No. 657069)

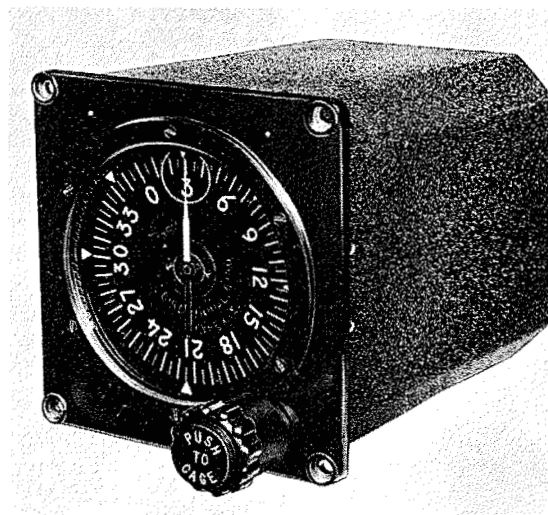


Figure 1B - Directional Gyro Indicator
(AF Type C-5, Sperry Part No. 652191)



Figure 1A - Directional Gyro Indicator
(Navy Stock No. R88-I-1006,
Sperry Part No. 661560)



Figure 1C - Directional Gyro Indicator
(Navy Stock No. R88-I-1006-20,
Sperry Part No. 653290)



Figure 1D - Directional Gyro Indicator
(Navy Stock No. R88I1006-020-000,
Sperry Part No. 674174)

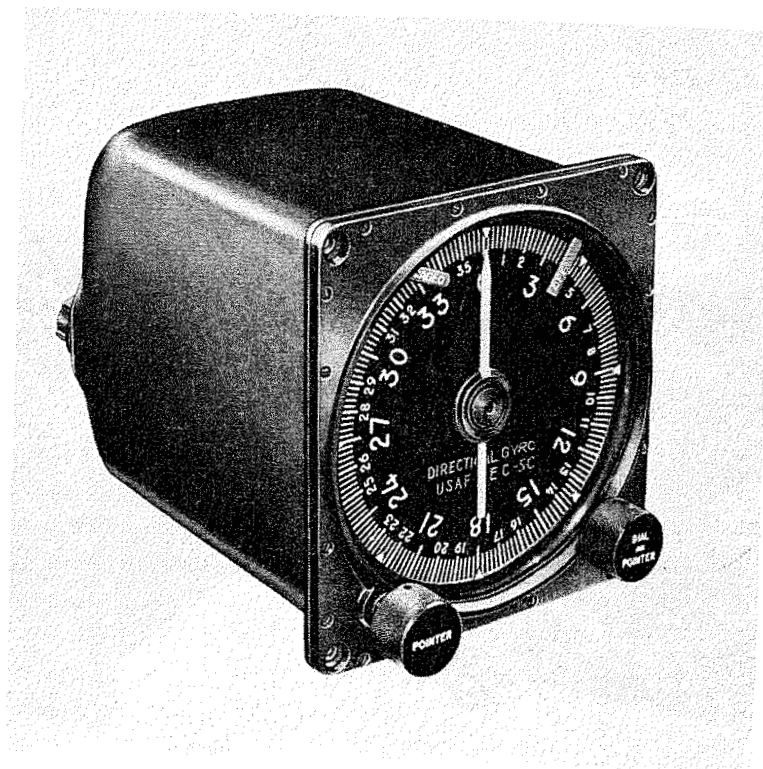


Figure 1E - Directional Gyroscopic Indicator
(AF Type C-5C, Sperry Part No. 674090)

SECTION I

INTRODUCTION

1. This Handbook is issued as the general basic instructions for the equipment involved. It contains descriptive data, and instructions for the installation, operation, service inspection, maintenance, lubrication,

overhaul, and testing of the Type C-1 Turn Indicator and the Type C-5 and the Navy Directional Gyro Indicators manufactured by Sperry Gyroscope Company, Division of The Sperry Corporation, Great Neck, New York.

<u>Nomenclature</u>	<u>Sperry Part No.</u>	<u>Navy Stock No.</u>	<u>AF Type</u>
Turn Indicator	657069	R88I1005-000-000	C-1
Directional Gyro Indicator	661560	R88-I-1006	-
Directional Gyro Indicator	652191	-	C-5
Directional Gyro Indicator	653290	R88-I-1006-20	-
Directional Gyro Indicator	674174	R88I1006-020-000	-

NOTE

This handbook contains only Overhaul Instructions and Part Catalog for the AF Type C-50 Directional Gyroscopic Indicator, manufactured by Sperry Gyroscope Company, Division of the Sperry Corporation, Great Neck, New York. For operation and service instructions covering the instrument refer to the latest applicable Operation and Service Handbook.

SECTION II

DESCRIPTION

1. GENERAL

a. All five types of Indicators, by means of an electrically driven gyro, establish a reliable flight reference for directional (azimuth) control of the aircraft.

b. The indications of the Type C-1 Turn Indicator (figure 1) and the Navy Directional Gyro Indicators (figures 1A, 1C, and 1D) are shown on the face of the instrument by a vertical compass card (dial) which is read in relation to the lubber line. Also, auxiliary indices are provided at 45, 90, and 180 degrees from the lubber line. This makes it possible to determine at a glance (without mental calculation) the heading to be flown when making 45-, 90-, or 180-degree turns.

bA. The indications of the Type C-5 Directional Gyro Indicator (figure 1B) are shown by the movement of a rotating pointer against a graduated dial. This dial is normally stationary, but it may be rotated, independently of the pointer, to any desired position. The pointer and dial may also be locked together and rotated to any desired position.

c. The "LOCK AND SET CARD" knob (figure 1) of the Type C-1 Turn Indicator is used to cage (lock) the gyro, making the instrument non-indicating. The knob is also used to set the card to the desired heading, usually the magnetic compass heading to be flown.

cA. The "PUSH TO CAGE" knob of the Navy Directional Gyro Indicators (figures 1A, 1C, and 1D) when pushed in, cages the gyro, and when rotated in this position revolves the dial relative to the lubber line. When pulled

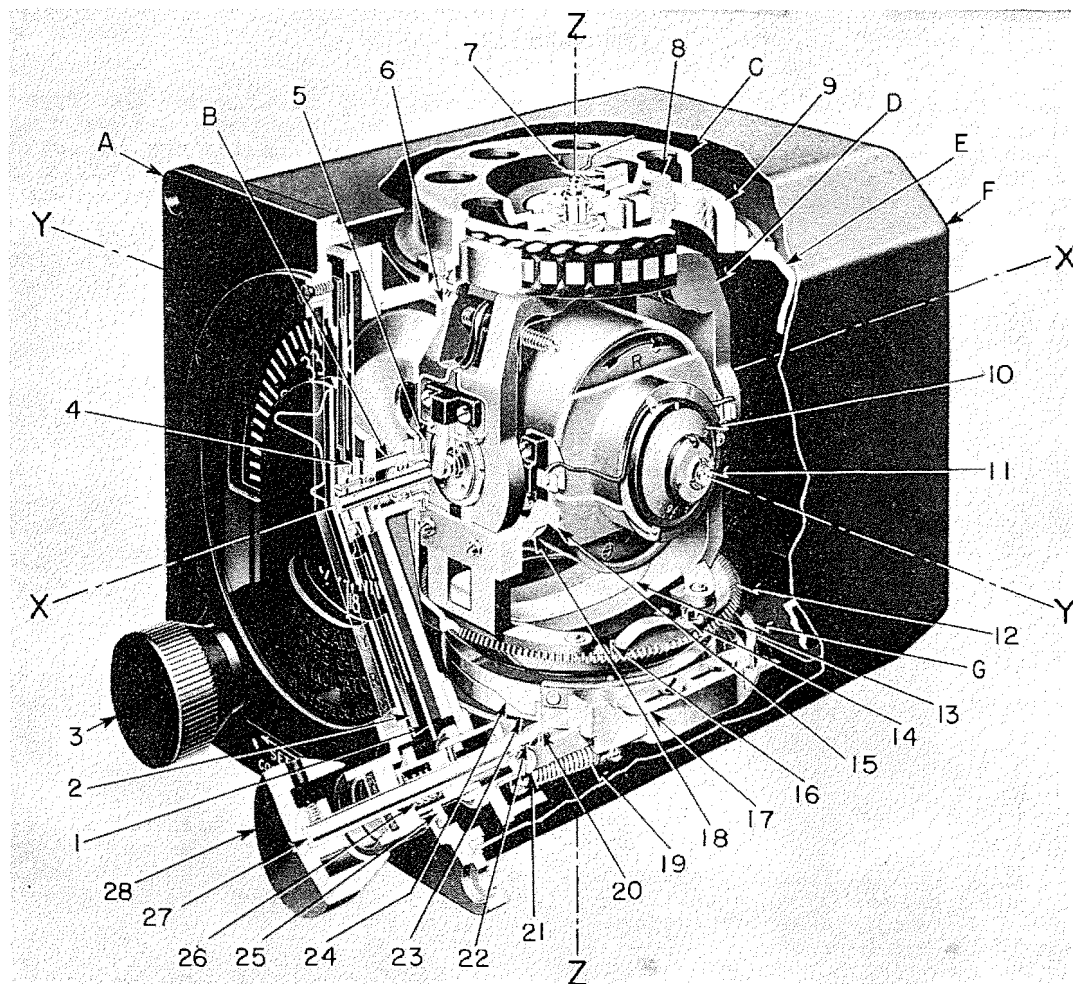
out it uncages the gyro and allows the dial to rotate freely in response to gyro movements. Rotation of the knob in the pulled-out position has no effect on the instrument.

NOTE

The "PUSH TO CAGE" knob of the Navy Directional Gyro (Stock No. R88I1006-020-000) will not revolve the dial until the knob is pushed all the way in. This prevents rotation of the dial until the gyro is completely caged, thus preventing excessive drift which might occur if the gyro were upset as the dial is turned.

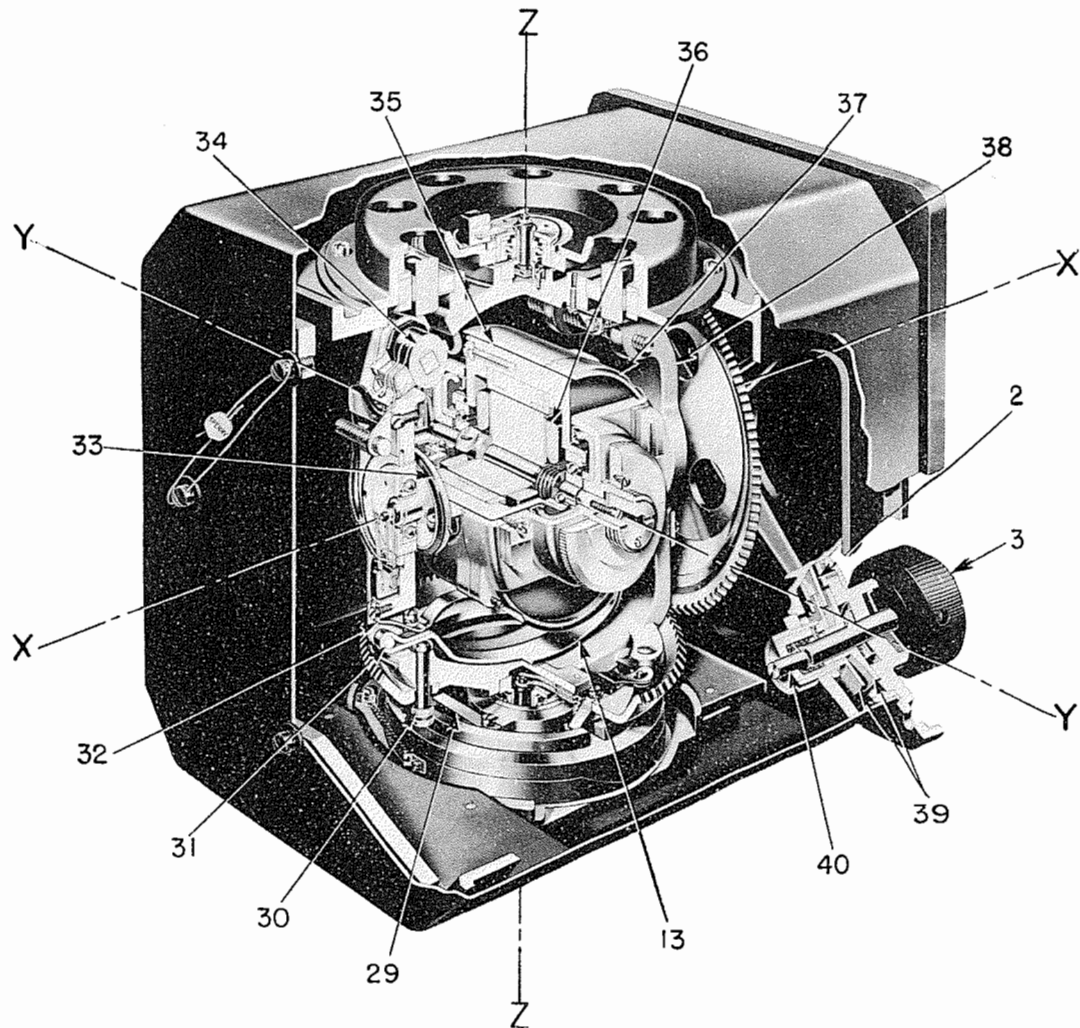
cB. The "PUSH TO CAGE" knob of the Type C-5 Directional Gyro Indicator, (figure 1B) when pushed towards the instrument, cages the gyro and locks the pointer and dial together. While the gyro is caged, the pointer and dial may be rotated together by rotating the knob. Pulling the knob out uncages the gyro, and allows the pointer to rotate independently of the dial as it indicates the movements of the gyro. Rotating the knob in the uncaged position will rotate the dial but not the pointer.

d. The "SET COURSE" knob of the Turn Indicator (figure 1) is used to set the luminescent arrowhead of the course indicator dial to the heading to be flown. When the "SET COURSE" knob is released, the arrowhead is free to move with the card. This designates on the card a convenient reference point to keep aligned with the lubber line, removing the need for remembering or reading a numerical value to keep the aircraft "on course".



- | | |
|--|---|
| A-Front Panel Assembly | E-Chassis |
| B-Card (Dial) Assembly | F-Case |
| C-Upper Bracket Assembly | G-Lower Bracket Assembly |
| D-Vertical Gimbal Ring Assembly | R-Direction of Rotation, Gyro Rotor |
| ----- | |
| 1-Card (Dial) | 15-Gyro Housing Stop (Leveling Cam) |
| 2-Course Indicator Dial | 16-Brake Shoe |
| 3-Setting Knob (Course Indicator Dial) | 17-Caging Slide |
| 4-Slip Clutch (Course Indicator Dial) | 18-Leveling Cam |
| 5-Slip Clutch (Card) | 19-Coil Spring (Caging Mechanism) |
| 6-Gear (Dial Assembly) | 20-Detent Plate (Projection) |
| 7-Contact Assembly (Upper) | 21-Detent Plate Stud |
| 8-Torque Motor (Stator) | 22-Detent (Caging Shaft) |
| 9-Torque Motor (Squirrel Cage) | 23-Bottom Ring |
| 10-Latitude Corrector Nut | 24-Top Plate |
| 11-Latitude Corrector Stud | 25-Card Setting Gear |
| 12-Gear (Vertical Gimbal Ring) | 26-Card Setting Gear Spring |
| 13-Gyro Housing Caging Arm (Leaf Spring) | 27-Caging Shaft |
| 14-Brake Shoe Spring | 28-Lock and Set Card Knob (Caging Knob) |
| ----- | |
| X-Longitudinal (Roll) Axis | Y-Lateral (Pitch) Axis |
| Z-Vertical (Yaw) Axis | |

Figure 2 - Cutaway View of the AF Type C-1 Turn Indicator - Front



- | | |
|--|---|
| 2-Course Indicator Dial | 34-Leveling System Transformer |
| 3-Setting Knob (Course Indicator Dial) | 35-Gyro Rotor |
| 13-Gyro Housing Caging Arm (Leaf Spring) | 36-Gyro Stator |
| 29-Spring (Top Plate) | 37-Gyro Housing |
| 30-Plunger | 38-Vertical Gimbal Ring |
| 31-Pivot (Gyro Housing Caging Arm) | 39-Clutch Discs (Course Indicator Dial) |
| 32-Spring (Gyro Housing Caging Arm) | 40-Release Spring (Set Course Knob) |
| 33-Leveling Switch Conducting Segment | |
-
- X-Longitudinal (Roll) Axis Y-Lateral (Pitch) Axis Z-Vertical (Yaw) Axis

Figure 3 - Cutaway View of the AF Type C-1 Turn Indicator - Rear

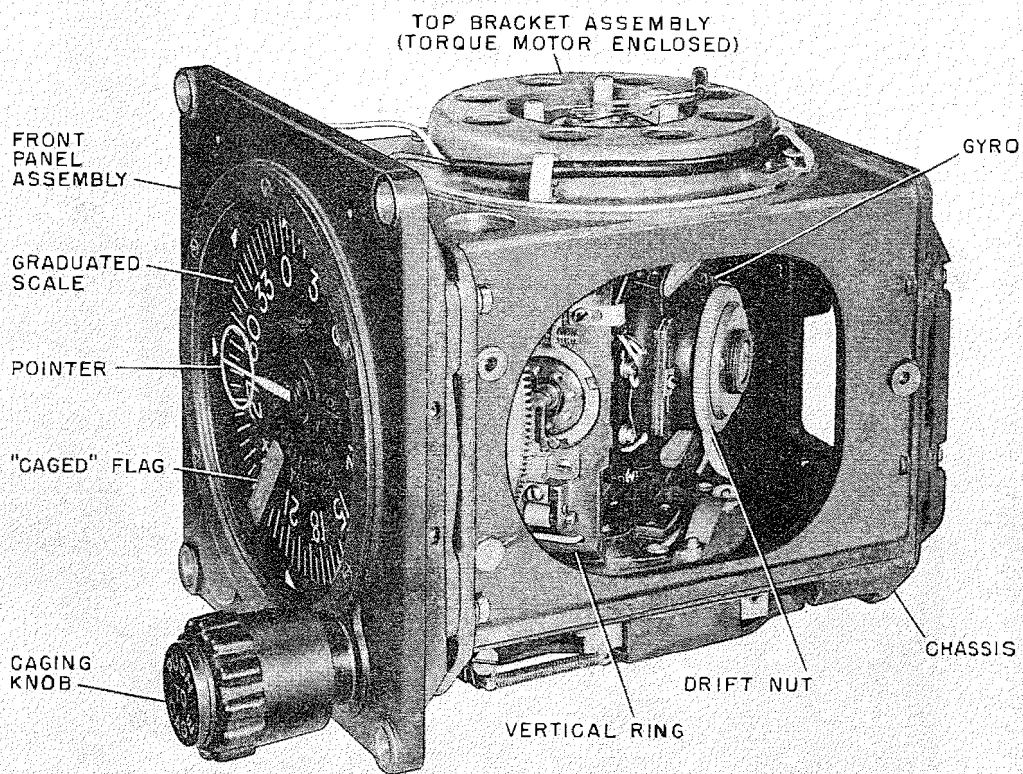


Figure 3A - Type C-5 Directional Gyro Indicator -
Right Internal View

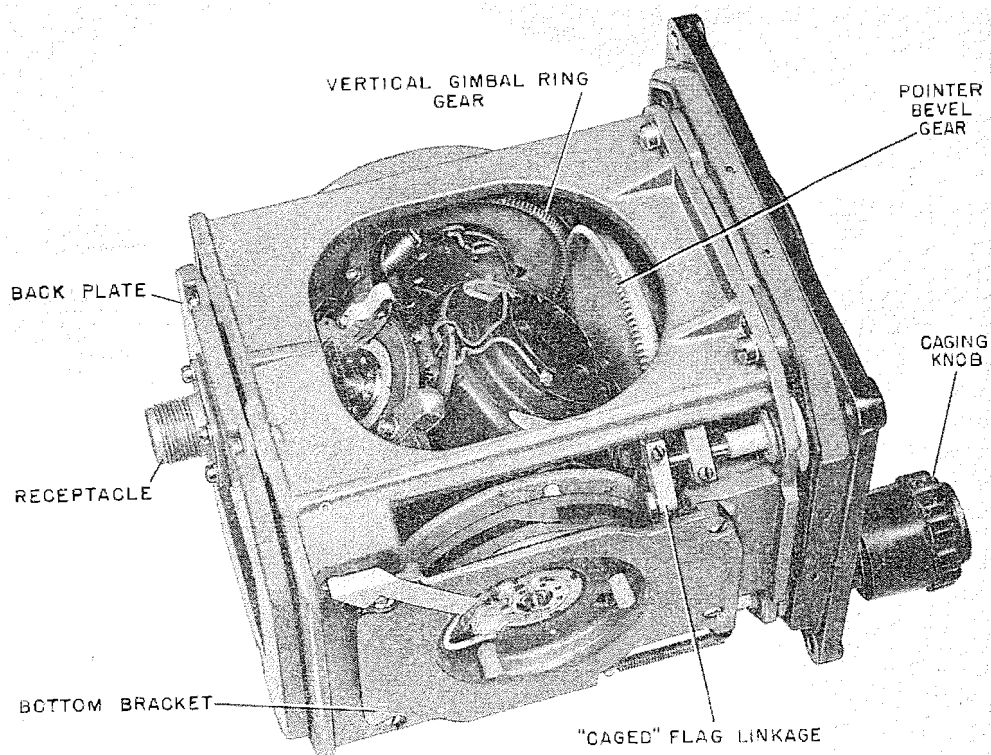


Figure 3B - Type C-5 Directional Gyro Indicator -
Left and Bottom Internal View

e. On Air Force Type C-5 and Navy (Stock No. R88-I-1006-20 and R88I1006-020-000) Indicators, the inside of the bezel glass is coated with a film which acts as a conductor of current, offering 2600 to 6600 ohms resistance between two continuous contacts forming 90-degree arcs and diametrically opposite. Thus heat is produced to dissipate any vapor within the case, and so prevent fogging of the glass as the temperature varies. To establish positive contact to the power supply and to distribute the current evenly through the film, a metal contact strip presses against the rim of the glass.

2. DETAILED.

NOTE

Except when otherwise noted, the following descriptions apply to the Type C-1 Turn Indicator, the Navy Directional Gyro Indicators, and the Type C-5 Directional Gyro Indicator.

a. ASSEMBLIES. - The indicator (figures 2, 3, 3A, and 3B) is composed of six main assemblies: The vertical gimbal and gyro assembly (D), the top and bottom bracket assemblies (C) and (E), the dial (card) assembly (B), the front panel assembly (A), and the chassis (F). The case (F) encloses the chassis and working parts of the instrument.

b. THE GYRO. (See figures 2, 3, 3A, and 3B.)

(1) The gyro rotor (35, figure 3), which is the rotor (squirrel cage) of a 3-phase induction motor, spins about the stator (36)

(winding). The rotor and stator, comprising the motor, are enclosed in the gyro housing (37).

(2) Three-phase power to the stator for driving the gyro rotor is supplied through the receptacle (on the back of the case) which is connected to contact assemblies at the top, bottom, and sides of the vertical gimbal ring. One of the contact assemblies is shown as 7, figure 2.

NOTE

The leads from the gyro are attached to contact assemblies on the gyro housing, except on the indicator, Navy Stock No. R88I1006-020-000. On this unit, the leads are soldered to lugs on the gyro housing.

(3) The gyro rotor (35, figure 3), spins in bearings about a lateral axis (Y), in the direction (R) on bearings in the gyro housing (37). The gyro housing is free to turn (within limits) about the longitudinal axis (X) on bearings in the vertical gimbal ring (38). The vertical gimbal ring turns about a vertical axis (Z) on bearings in the top and bottom bracket assemblies. Thus the gyro is universally mounted, having three axes of freedom.

(4) Due to the gyroscopic principle of rigidity, when the gyro rotor is spinning, the vertical gimbal ring remains fixed in azimuth as the aircraft turns. However, the apparent motion is rotation of the vertical gimbal ring within the case. This rotation

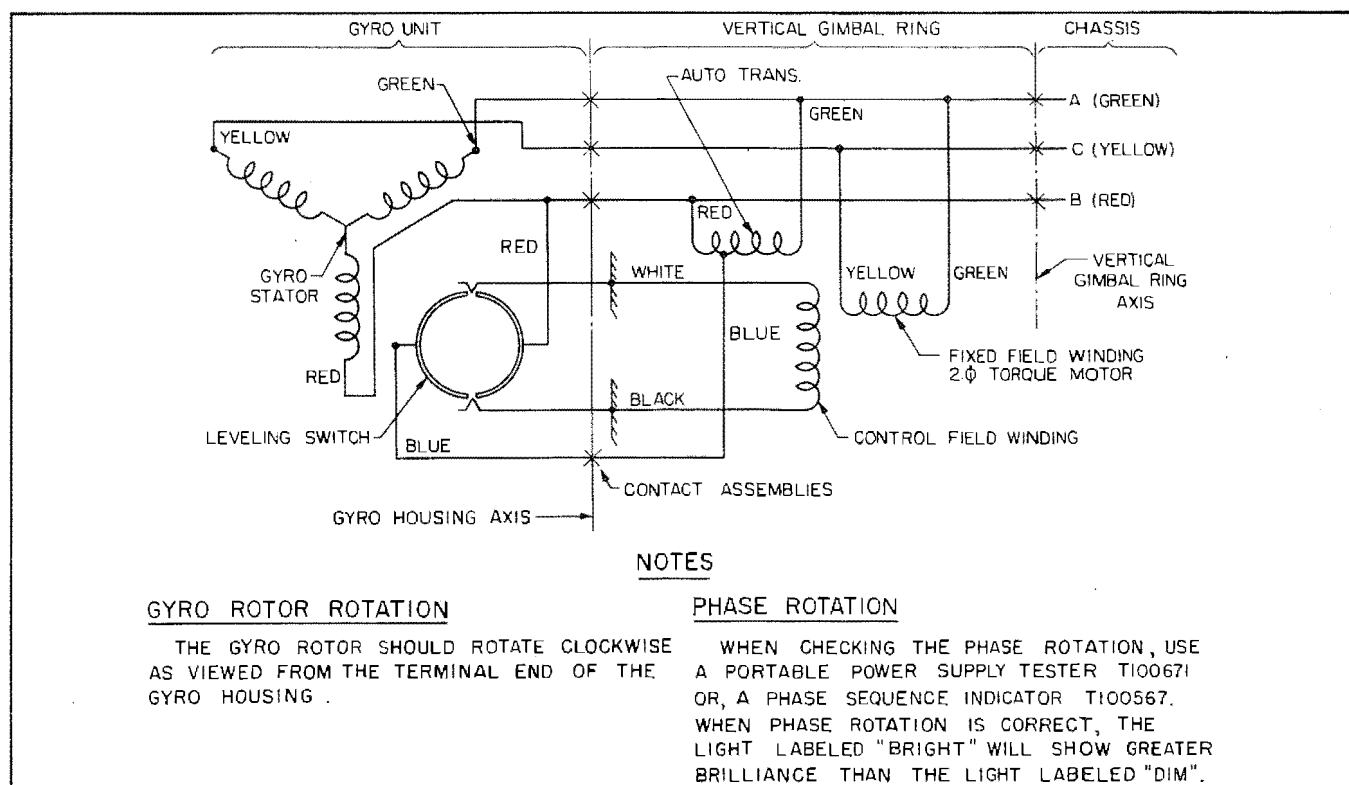


Figure 4 - Schematic Wiring Diagram of the AF Type C-1 and Navy (Stock No. R88-I-1006) Indicators

is transmitted to the card (1, figure 2), or pointer (figure 3A), through the gear (6, figure 2 or figure 3B) which meshes with the vertical gimbal ring gear (12, figure 2 or figure 3B). Therefore, the card, in relation to the lubber line, on the front of the instrument, or the pointer relative to the graduated scale provides an indication of the amount of turn of the aircraft.

c. THE LEVELING SYSTEM.

(1) Due to bearing friction and slight unbalance, which cannot be entirely eliminated, the gyro has a tendency to depart (precess) from its level position and would hit the stops (15, figure 2), if it were not controlled. This is overcome by the leveling system, consisting of the torque motor, leveling switch, and a voltage-reduction (auto) transformer.

(2) The torque motor is composed of two parts - the squirrel cage (9), which is attached (stationary) to the upper bracket assembly (c) and the coil (stator) (8), which is attached to the vertical gimbal ring (38, figure 3) and rotates with it.

(3) The stator coil (8, figure 2) is made up of two interwoven windings, a fixed field winding, and a control field winding. (See figure 4 and 4A.) The fixed field winding is directly connected to the A-C phase of the 115-volt, 3-phase power supply and is, therefore, constantly energized.

(4) The auto transformer shown as 34, figure 3, is directly connected to the A-B phase of the power supply (figures 4 and 4A)

and is also constantly energized. The reduced voltage of the transformer (2 volts) is applied to the conducting segments of the leveling switch. The leads of the control field winding are connected to the leveling switch brushes. Therefore, power is supplied intermittently to the control field winding by action of the leveling switch.

(5) The magnetic field, created by the constantly energized fixed field winding of the torque motor coil, is not a rotating field and therefore no torque (turning force) is applied to the vertical gimbal ring. However, if power from the transformer is applied to the control field winding, the combined magnetic fields create a rotating field applying a torque in one direction to the vertical gimbal ring. If the polarity of the power applied to the control field winding is reversed, the magnetic field rotates in the opposite direction, reversing the torque applied to the vertical gimbal ring.

(6) The purpose of the leveling switch, of which one conducting segment is shown as 33, figure 3, is to reverse the polarity of the power applied to the control field winding of the torque motor coil. The leveling switch functions as a double-pole, double-throw reversing switch. The circular conducting segments of the leveling switch (figure 5) are attached to the gyro housing and are rotated as the housing tilts from the level position. Therefore, the polarity of the power applied to the control field winding is dependent on the direction of tilt of the gyro housing. The brushes of the leveling switch are attached to the vertical gimbal ring and remain stationary.

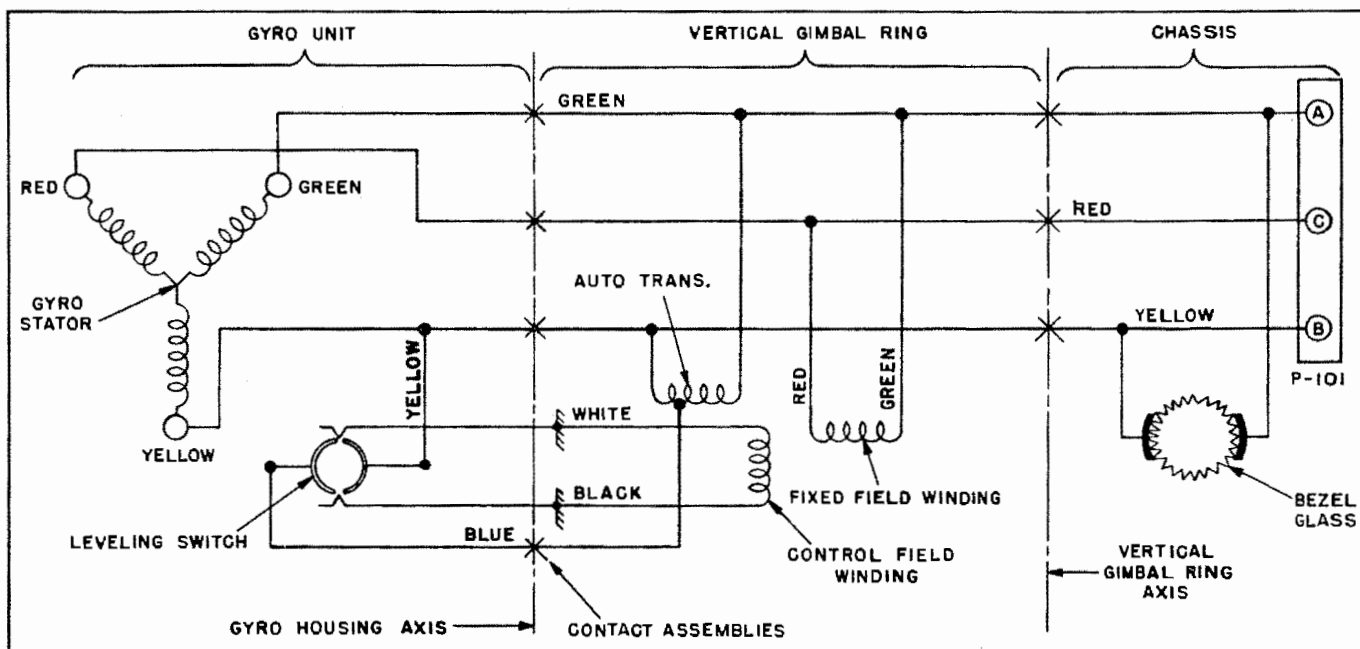


Figure 4A - Schematic Wiring Diagram of the AF Type C-5 and Navy (Stock No. R88-I-1006-20 and R88I1006-020-000) Indicators

NOTE

For the sake of simplicity in explanation, the leveling switch is shown schematically in figure 5 on the outside of the vertical gimbal ring. However, the leveling switch is actually located on the inside of the vertical gimbal ring. (See figure 5).

(7) When the gyro housing is in the level position (figure 5), the brushes rest on the insulating segments that separate the conducting segments. In this position, no power is supplied to the control field winding of the torque motor stator coil and no torque is applied to the vertical gimbal ring.

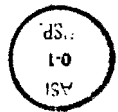
(8) If the gyro housing tilts (figure 5), the conducting segments are rotated, establishing contact between one lead of the transformer and a lead of the control field winding, as well as between the second lead

of the transformer and the other lead of the control field winding. (See figure 4 and 4A.) With the power thus supplied to the control field winding, the torque motor applies a torque to the vertical gimbal ring.

(9) This corrective torque, utilizing the principle of precession, when applied in the proper direction about the vertical axis, causes the gyro housing to precess back to the position level with the case.

(10) If the gyro housing tilts in the opposite direction, the leveling switch supplies power of the opposite polarity to the control field winding, applying opposite torque about the vertical axis and the gyro housing is again returned to the level position.

(11) Thus the gyro is forced to maintain its position level with the case and is thus prevented from precessing and hitting the stops.





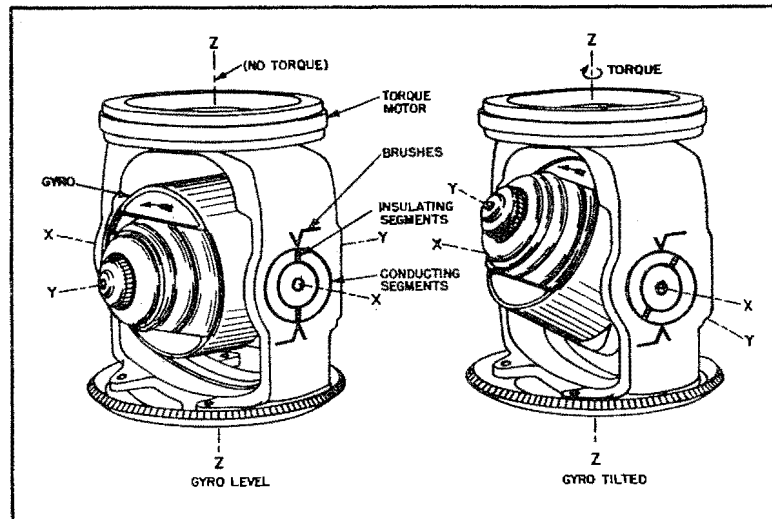


Figure 5 - Leveling System Schematic

**d. CAGING AND SETTING MECHANISMS OF THE AF
TYPE C-1 TURN INDICATOR.**

**(1) LOCKING (CAGING) MECHANISM OF THE
TURN INDICATOR.**

(a) As the "LOCK AND SET CARD" knob (28, figure 2) is pushed in, the end of the shaft (27) pushes the caging slide (17) which in turn pulls on the bottom ring (23) to rotate it against the pull of the coil springs (19). One coil spring (19) is attached to the caging slide (17) and the detent plate (20) which is pivoted on the detent plate stud (21). The other coil spring is attached directly to the bottom bracket. As the bottom ring (23) is rotated, the top plate (24) is lifted by the inclined surface on the bottom ring (similar to a cam follower). The top plate is lifted against three leaf springs, one of which is shown as 29, figure 3.

(b) Lifting of the top plate engages it with the two brake shoes, one of which is shown as 16, figure 2. The two brake shoes are pressed down against the top plate by the action of two brake shoe springs one of which is shown by (14). This action brakes further rotation of the vertical gimbal ring, holding it in a fixed position.

(c) Lifting of the top plate also raises the plunger (30, figure 3), which rotates the caging arm (13) (leaf spring) about the pivot pin (31) against the action of the spring (32). The opposite end of the caging arm contacts the leveling cam (18, figure 2), attached to the gyro housing (37, figure 3), rotating the gyro housing until it is level. When the gyro housing reaches the level position, the end of the caging arm (13) falls into a depression in the cam (18, figure 2), holding the gyro housing in the level position.

(d) The stops (15, figure 2), on each end of the leveling cam, limit the rotation of the gyro housing about the axis (X). When the gyro housing tilts to 60 degrees from the vertical, the projection (15) on the cam (18) contacts the leaf spring (13) preventing further tilting.

(e) When the "LOCK AND SET CARD" knob is pushed in far enough, the action of the spring (19) on the detent plate causes the projection (20) on the detent plate to fall into the detent (22) in the shaft. This raises the extreme end of the detent plate (20) so that it holds the caging slide (17) in the caged position. Thus the vertical gimbal ring (38, figure 3), and the card which is geared to it are locked in whatever position they happen to be at the time. Also the gyro housing (37) is leveled and locked (caged) in the level position.

(f) When the "LOCK AND SET CARD" knob (28, figure 2) is pulled out, the projection (20) on the detent plate is forced out of the detent (22) in the shaft. This permits the springs (19) to reverse the rotation of the bottom ring, lowering the top plate (24) and releasing the brake shoes (16) and the plunger (30, figure 3). This leaves the vertical gimbal ring, the card, and the gyro, free and unlocked (uncaged).

**(2) CARD SETTING MECHANISM OF THE
TURN INDICATOR.**

(a) When the "LOCK AND SET CARD" knob (28, figure 2) is pushed in to the detent position, the gear (25) pinned to the shaft (27) engages the gear teeth on the edge of the card against the action of the spring (26). In this position, rotation of the "LOCK AND SET CARD" knob rotates the card (1) which slips relative to the vertical gear (6) through the action of the slip clutch (5), permitting the card to be set to the desired reading.

Note

When the card is rotated by the "LOCK AND SET CARD" knob, the course indicator dial (2) is also rotated with the card.

(b) When the "LOCK AND SET CARD" knob is pulled out, the gear (25) is disengaged from the gear teeth on the edge of the card, leaving the card free (unlocked).

e. SET COURSE MECHANISM OF THE TURN INDICATOR.

(1) When the "SET COURSE" knob (3, figure 2) is pushed in, the course indicator dial (2) is gripped between the two clutch discs (39, figure 3), whereupon rotation of the knob revolves the two clutch discs which in turn rotate the course indicator dial. The dial is slipped relative to the card (1, figure 2), through the action of the slip clutch (4). This provides a means of setting the arrowhead on the course indicator dial (figure 1) to indicate the desired heading to be flown.

(2) When the "SET COURSE" knob (3) is released, the action of the spring (40, figure 3) forces the knob out to its normal position, disengaging the clutch discs from the course indicator dial. The dial is then free to rotate as a single unit with the card.

eA. CAGING AND SETTING MECHANISMS OF THE AF TYPE C-5 AND NAVY DIRECTIONAL GYRO INDICATORS.

(1) LOCKING (CAGING) MECHANISM OF THE TYPE C-5 AND NAVY DIRECTIONAL GYRO INDICATORS.

NOTE

Since the action of the locking mechanisms of the Indicators is alike, figures 2 and 3, rather than 3A and 3B are used in the following explanation.

(a) As the "PUSH TO CAGE" knob is pushed in, the end of the shaft (17) pushes the caging slide (27, figure 2) which in turn pulls on the bottom ring (23) to rotate it against the pull of the coil springs (19). One coil spring (19) is attached to the caging slide (17) and the detent plate (20) which is pivoted on the detent plate stud (21). The other coil spring is attached directly to the bottom bracket. As the bottom ring (23) is rotated, the top plate (24) is lifted by the inclined surface on the bottom ring (similar to a cam follower). The top plate is lifted against three leaf springs, one of which is shown as 29, figure 3.

(b) Rotation of the bottom ring also actuates a linkage which rotates the "CAGED" flag into the visible portion of the dial.

(c) Lifting of the top plate engages it with the two brake shoes, one of which is shown as 16, figure 2. The two shoes are pressed down against the top plate by the action of two brake shoe springs, one of which is shown as 14. This action brakes further rotation of the vertical gimbal ring, holding it in a fixed position.

(d) Lifting of the top plate also raises the plunger (30, figure 3), which rotates the caging arm (13) (leaf spring) about the pivot pin (31) against the action of the spring (32). The opposite end of the caging arm contacts the leveling cam (18, figure 2), attached to the gyro housing (37, figure 3), rotating the gyro housing until it is level. When the gyro housing reaches the level position, the end of the caging arm (13) falls into a depression in the cam (18, figure 2), holding the gyro housing in the level position.

(e) The stops (15, figure 2), on each end of the leveling cam, limit the rotation of the gyro housing about the axis (X). When the gyro housing tilts to 85 degrees from the vertical,

the projection (15) on the cam (18) contacts the leaf spring (13) preventing further tilting.

(f) When the "PUSH TO CAGE" knob is pushed in far enough, the end of the caging slide passes the end of the detent plate (20), which is spring loaded and moves up to hold the caging slide in the caged position.

(g) When the "PUSH TO CAGE" knob is pulled out, the detent plate is forced down so that the caging slide is released. This permits the springs (19) to reverse the rotation of the bottom ring, lowering the top plate (24) and releasing the brake shoes (16) and the plunger (30, figure 3). This leaves the vertical gimbal ring and the gyro free and unlocked (uncaged).

(2) CARD AND COURSE SETTING MECHANISM OF THE AF TYPE C-5 AND NAVY DIRECTIONAL GYRO INDICATORS.

(a) The card is geared directly to the shaft of the "PUSH TO CAGE" knob, through the gears of the card and on the shaft. Rotation of the knob of the Type C-5 Indicator, whether in the caged or uncaged position, will cause the card to rotate. The knob of the Navy Directional Gyro Indicator will rotate the dial only in the caged position.

NOTE

In order to prevent turning the card until the gyro is caged, the gear in Directional Gyros, Navy Stock No. R8811006-020-000, is thinner, so that the gear will not engage the card gear until the knob is pushed all the way in, assuring positive caging at any time that the heading is to be changed.

(b) When the "PUSH TO CAGE" knob of the Type C-5 Indicator is in the caged position, the gear on the shaft engages the gear on the pointer, so that the pointer and card will rotate together. The pointer is permitted to slip relative to the vertical gear through the action of the slip clutch, allowing the pointer to be set to the desired position.

f. THE LATITUDE CORRECTOR OF THE AF TYPE C-1 INDICATORS.

NOTE

The latitude corrector is used only on the Type C-1 and the Navy Directional Gyro Indicators.

(1) The latitude corrector (10, figure 2) is a calibrated nut which may be adjusted in or out on a threaded stud (11) on the gyro housing to minimize gyro drift due to the earth's rotation. This drift is zero at the equator and a maximum at the poles.

(2) The latitude corrector nut (10) is calibrated to either side of "0" with graduations marked "1" to "7". North latitude graduations are indicated to the left of "0" by the mark "N" and south latitude graduations are indicated to the right of "0" by the mark "S". The numbers "1" to "7" represent the 10th to the 70th degree north or south latitude.

(3) To minimize gyro drift, the position of the nut on the stud may be adjusted for the normal latitude of operation of the aircraft. After the nut is adjusted to the required position, it is held in place by action of the elastic insert inside the nut.

1. GENERAL.

b. The instrument should be installed so that it is level laterally (within 1 degree) when the aircraft is in level flight.

2. POWER SUPPLY.

A power supply of 115 volts (± 10 volts), 3-phase, 400 cycles (± 40 cycles) ac is required to operate the Indicators. Power consumption of the Type G-1 and Navy (Stock No. R88-I-1006) Indicators is 20 watts running. Power consumption of the Type G-5 and Navy (Stock No. R88-I-1006-20 and R88I1006-020-000) Indicators is: starting, 40 watts; running, 20 watts; power factor, 0.5. The phase rotation of the power supply must be in accordance with instructions given in figure 4.

The Indicator will not function properly unless the power supply is held within the specified limits. If necessary, means of holding the voltage and frequency of the aircraft's power supply to these requirements must be installed.

The instrument power supply should include protective devices in accordance with installation regulations. It is recommended that the instrument should be controlled only by the aircraft's main power supply switch, so that anytime this switch is closed, the a-c circuit is connected to the instrument. The phase rotation should be ABC with the A-phase ground. Therefore, the inverter ground should be connected to pin A of the AN receptacle on the instrument.

a. GENERAL.

(1) There are three methods for mounting the Indicators: directly in the panel, in an individual mounting frame, and in a double mounting frame.

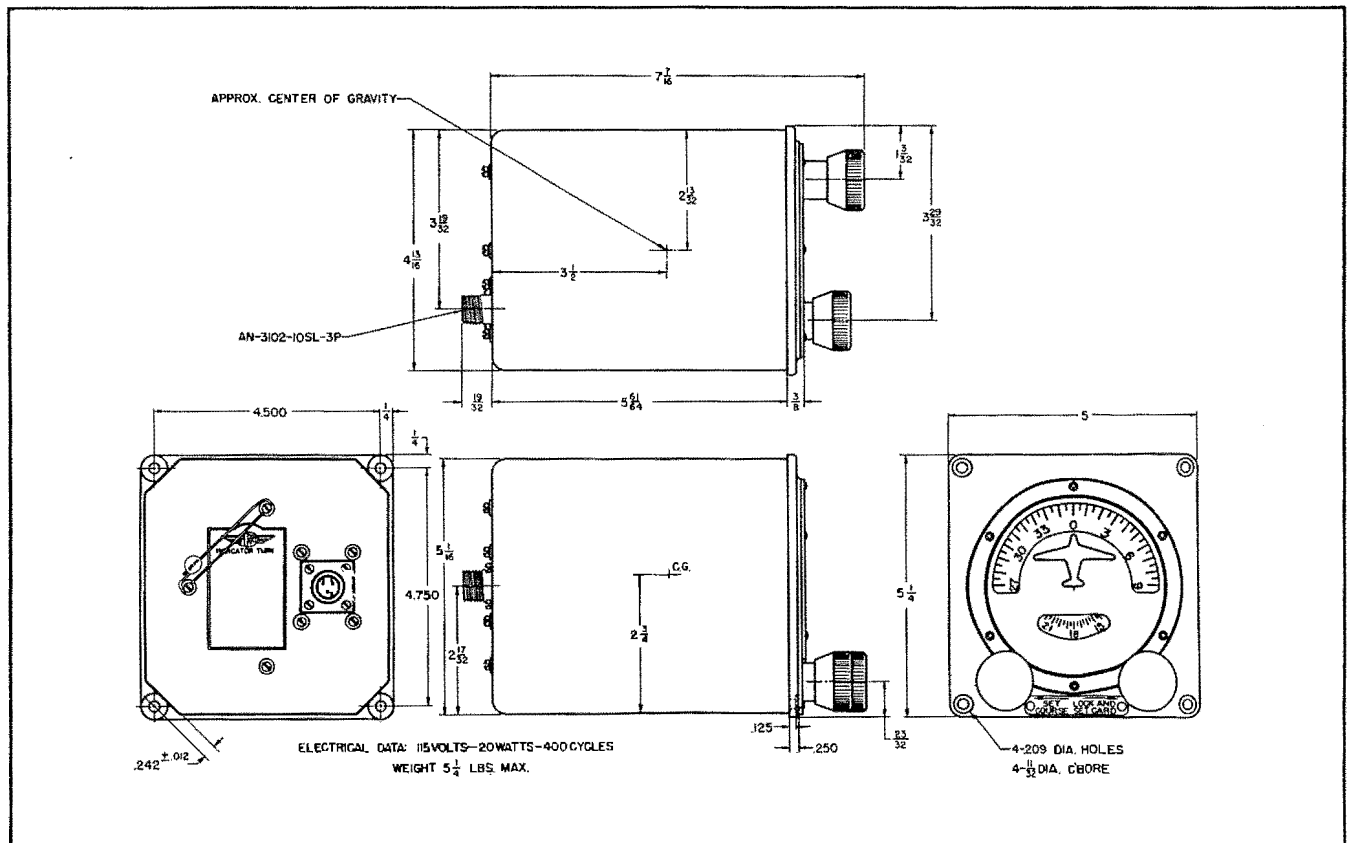


Figure 6 - Outline Drawing (AF Type C-1 Indicator, Sperry Part No. 657069)

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(2) The double mounting frame (for side-by-side mounting of the Type C-1 (or C-5) Indicator with either the Type E-1 Flight Indicator, or the Type J-1 Attitude Gyro Indicator) is to be used whenever both instruments are installed in mounting frames.

(3) Paragraphs 3.b., c., and d. that follow give instructions for the various methods of installation.

b. INSTALLATION WITHOUT MOUNTING FRAME.

(1) For this type of installation make the panel cut-out, drill the mounting holes and rivet elastic stop nuts to the panel as shown in figure 7.

(2) When the Indicator, and the Type E-1 Flight Indicator or the Type J-1 Attitude Gyro Indicator are to be installed, they should be mounted side-by-side. Panel cut-outs for both instruments are identical. Figure 7 indicates the type and location of elastic stop nuts to be used for an individual as well as a dual installation.

Note

The Navy Directional Gyro Indicators shown in figures 1A and 1C are rear mounted. Elastic stop nuts are an integral part of these instruments and need not be installed on the panel. (See figure 6A.)

(3) After the panel has been prepared for mounting, refer to this section, paragraphs 4 and 5.

c. INSTALLATION WITH INDIVIDUAL MOUNTING FRAME.

(1) Mounting frame, AF No. 43B7625, is to be used when the Type C-1 (or C-5) Indicator alone is installed. (See figure 8.)

(2) Make the panel cut-out by placing the frame in the required position, then use the opening in the frame as a template.

(3) Locate and drill the mounting holes for the instrument and the rivet holes for the mounting frame as shown in figure 8.

(4) After the panel cut-out has been made and the mounting frame attached, refer to this section, paragraphs 4 and 5.

Note

Do not use two individual mounting frames, No. 43B7625, if either the Type C-1 (or C-5) Indicator and the Type E-1 Flight Indicator (or the Type J-1 Attitude Gyro Indicator) are to be installed; use the double mounting frame No. 43D7014. (Refer to this section, paragraph 3.d.)

d. INSTALLATION WITH DOUBLE MOUNTING FRAME.

(1) Mounting frame, AF No. 43D7014, is to be used when both the Type C-1 (or C-5) Indicator and the Type E-1 Flight Indicator (or the Type J-1 Attitude Gyro Indicator) are to be installed. The mounting frame mounts a pair of instruments side-by-side. (See figure 9.)

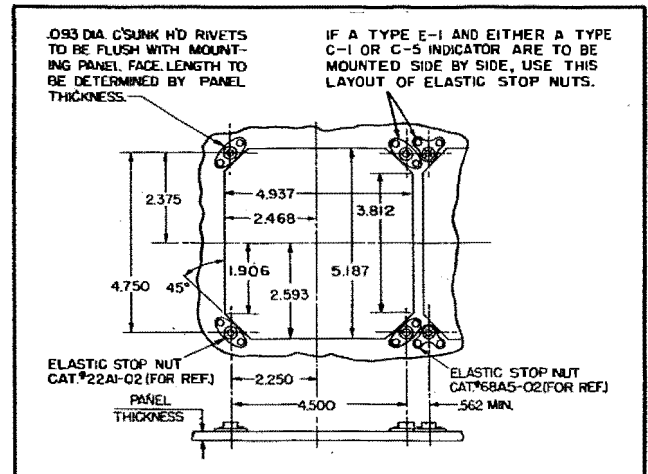


Figure 7 - Panel Cutout

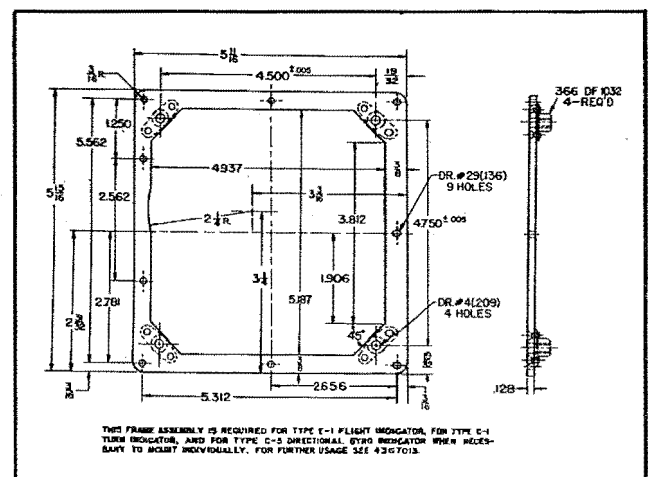


Figure 8 - Individual Mounting Frame

(2) Make the panel cut-out by placing the mounting frame in the required position, then use the opening in the frame as a template.

(3) Locate and drill the mounting holes for the instruments and the rivet holes for the mounting frame as shown in figure 8.

(4) After the panel cut-out has been made and the mounting frame attached, refer to this section, paragraphs 4 and 5.

4. CONNECTING THE POWER SUPPLY.

a. A plug, AN3106-10SL3S, for mating with the AN3102-10SL3P type of polarized receptacle on the back of the instrument, must be connected to the power supply cable.

Note

The cable must be long enough to permit withdrawal of the instrument from the front of the panel.

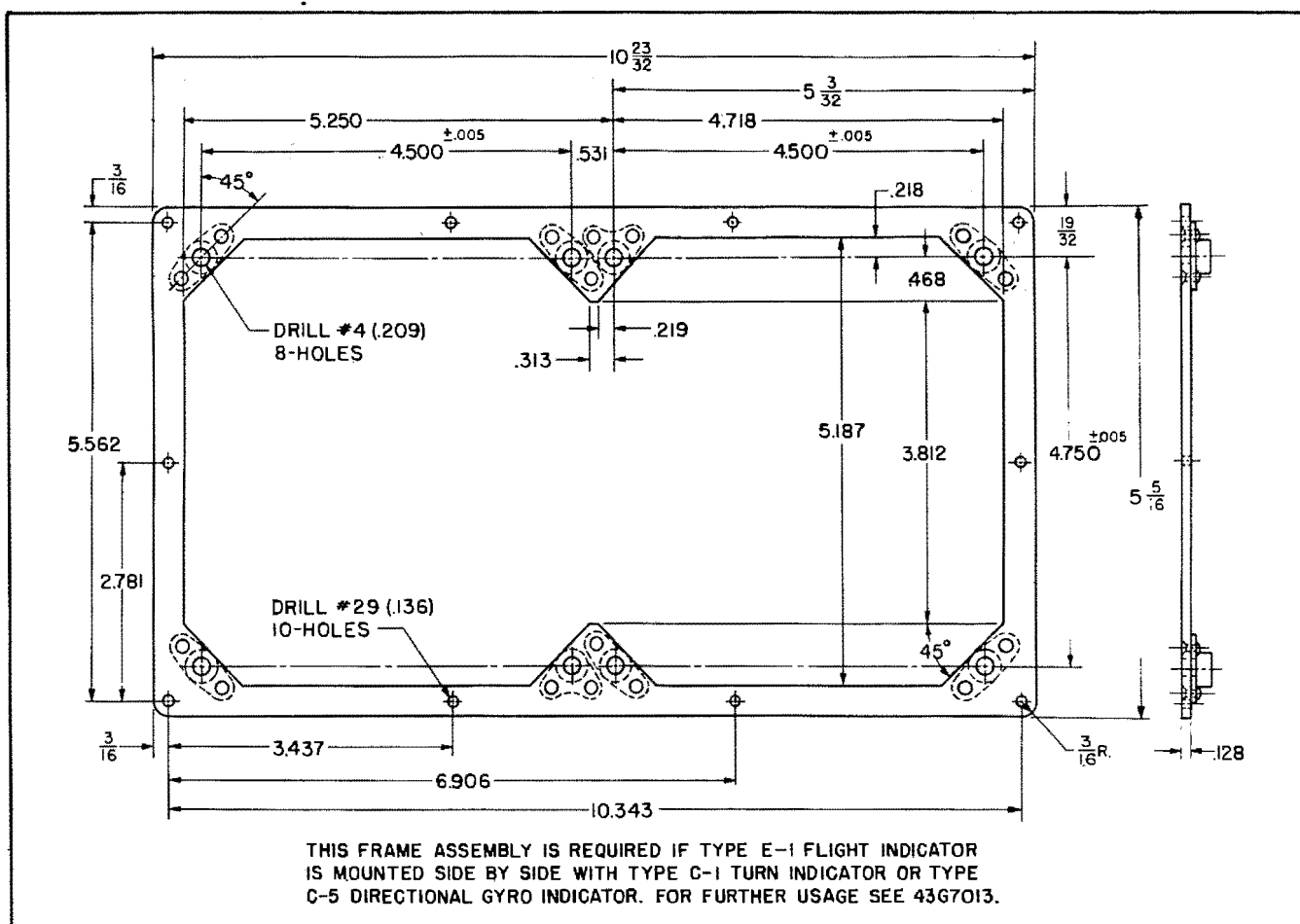


Figure 9 - Double Mounting Frame

b. After the plug has been connected to the power supply cable, connect the instrument load, and check the power supply. It should be within the following limits: 115 volts (± 10 volts), 400 cycles (± 40 cycles).

c. When checking the phase rotation, use a portable power supply tester T100671 or a phase sequence indicator T100567. When the phase rotation is correct, the light labeled "BRIGHT" will show greater brilliance than the light labeled "DIM".

CAUTION

The letters at the jack terminals on fixture T100567 refer to the prongs of the receptacle on the rear of the instrument. The phase rotation should be ABC with A-phase being ground. Therefore, the inverter ground should be connected to pin A of the AN receptacle on the instrument.

5. MOUNTING THE INSTRUMENT.

NOTE

Before mounting the instrument in the panel, it will be convenient at this time to adjust the latitude corrector for the latitude at which the flight check is to be made. Such adjustments can be made

only on the Type C-1 and the Navy Indicators as the Type C-5 has no latitude corrector. Directions for adjustments of the latitude corrector are given in section V, paragraph 3.b. However, this adjustment requires breaking of the seal on the case and, therefore, the operation should be performed only by qualified personnel.

a. After the panel has been prepared for mounting the instrument, the power supply cable installed, the power supply checked, and the plug connected to the instrument, the instrument is ready for mounting in the panel.

b. Insert the instrument in the panel cut-out and prepare to secure it in position. For Type C-1 Indicator use four (0.190-inch) 10-32 x 3/4-inch fillister-head, steel, machine screws and washers supplied for this purpose. For the Navy Directional Gyro Indicators use four (0.190-inch) 10-32 x 3/4-inch round head, brass, machine screws. For the Type C-5 Indicator use four (0.190-inch) 10-32 x 5/8-inch, fillister-head, brass, machine screws.

c. When attaching the instrument, make certain that all four corners of the instrument touch the panel (panel must be flat) so that the instrument will not be strained when the screws are tightened. Tighten the screws evenly.

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6. FLIGHT CHECK.

a. After the instrument has been installed, it should be checked in flight for proper functioning.

b. The drift of the card, when the latitude corrector is adjusted to the latitude in which the flight check is to be made, should not exceed 3 degrees in 10 minutes on any heading.

c. If the flight check shows that the drift is excessive, check the adjustment of the latitude corrector, the vibration of the instrument panel, and the voltage, phase rotation and frequency of the power supply.

(1) The power supply should be within limits as follows: 115 volts (± 10 volts), 400 cycles (± 40 cycles). Phase rotation should be as indicated in figure 4.

(2) For adjustment of the latitude corrector, refer to section V, paragraph 3.b.

(3) The vibration of the instrument panel should not exceed .004-inch amplitude.

d. If the instrument shows improper operation, refer to section V, paragraph 5, for a list of troubles and remedies.

SECTION IV

OPERATION

1. PRINCIPLES OF OPERATION.

a. THE GYRO.

(1) The two gyroscopic principles, rigidity and precession, are employed in the indicators to establish a reliable flight reference for control of the aircraft's heading.

(2) A gyro may be defined as a spinning rotor having three axes of freedom (universally mounted) so that its spin axis is free to assume any position in space.

(3) When spinning, the gyro obeys a fundamental gyroscopic principle, rigidity, which tends to maintain its spin axis fixed in space regardless of the movements of the supporting body. However, bearing friction and unbalance set up forces on the gyro that cause it to "precess" from its normally level position. Therefore, to prevent the gyro from precessing to the stops, it is provided with a leveling system which controls precession about the horizontal axis and forces the spin axis to remain level with the case.

(4) Precession, another fundamental gyroscopic principle, causes the spin axis to move, not in the line of the applied force, but 90 degrees away in the direction of rotation of the gyro rotor.

(5) Rotation of the earth also has an effect upon the gyro, producing gyro "drift". This effect varies from zero at the equator to

a maximum at the poles. The Turn Indicator and the Navy Directional Gyro Indicators are provided with a latitude corrector which may be adjusted to minimize this effect.

b. (Deleted).

c. (Deleted).

d. (Deleted).

e. THE LATITUDE CORRECTOR (AF TYPE C-1 AND NAVY INDICATORS).

(1) The latitude corrector is an adjustable weight, located on the gyro housing at one end of the gyro shaft. Unbalancing the gyro by adjusting the weight will cause the gyro to precess, the rate of precession being proportional to the amount of unbalance. Inasmuch as the rate and direction of gyro drift due to the earth's rotation is constant for a given latitude, unbalancing the gyro so as to give a precession that is equal and opposite to this drift will minimize the resultant drift.

2. OPERATING INSTRUCTIONS FOR AF TYPE C-1 TURN INDICATOR.

a. STARTING. - Turning on the aircraft's main power supply switch or the inverter switch starts the Turn Indicator. Thereafter, it is ready to be set for use, after allowing approximately 2 minutes for the gyro to come up to speed.

CAUTION

The instrument power supply should include protective devices in accordance with installation regulation. It is recommended that the instrument should be controlled only by the aircraft's main power supply switch, so that any time this switch is closed the a-c circuit is connected to the instrument.

b. SETTING THE INSTRUMENT.

(1) Push the "LOCK AND SET CARD" knob (figure 10) in all the way. It is not necessary to retain pressure on the knob to rotate the card if the gyro was caged when the knob was pushed in all the way. However, if pressure on the knob is required to rotate the card, the caging operation should be repeated. Pull knob straight out (uncage) leaving the card and course indicator free (unlocked).

(2) On those instruments which are equipped with a course indicator, push the "SET COURSE" knob in (figure 10) and while holding it in, rotate the knob to right or left until the arrowhead on the transparent course indicator dial is aligned with the lubber line. Then release the "SET COURSE" knob which leaves the course indicator free to rotate with the card.

NOTE

The course indicator, which rotates with the card, provides an easily read reference point on the card so that when the card is indicating "on course" the course indicator index is coincident with the lubber line.

(3) Pull the "LOCK AND SET CARD" knob straight out, leaving the card and the course indicator free (unlocked) to give indications for flying a straight course and making precision turns.

c. USING THE INSTRUMENT.

(1) STRAIGHT FLIGHT. - After the card and the course indicator of the Turn Indicator have been set, the Turn Indicator may be referred to, the same as the magnetic compass, for maintaining a straight course. By controlling the aircraft to keep the course indicator index aligned with the lubber line, the aircraft will be flown on a constant heading.

(2) TURNS.

(a) The Turn Indicator shows at a glance without calculation, the new heading to be flown when making 45-, 90-, or 180-degree turns.

(b) Observe the dial reading at the desired index (figure 10) and turn the aircraft until that reading comes under the lubber line. Indices are provided at 45 and 90 degrees to left and right of the lubber line to show the heading to be flown when making 45- or 90-degree turns.

(c) The card, as observed through the lower opening, shows a direct reading of the

reciprocal heading for making 180-degree turns. (See figure 10.)

d. CAGING AND UNCAGING (LOCKING AND UNLOCKING) THE INSTRUMENT.

(1) To cage (lock) the instrument, push the "LOCK AND SET CARD" knob in as far as it will go and leave it there. This locks the card and the gyro making the instrument nonindicating.

(2) To uncage (unlock) the instrument, pull on the "LOCK AND SET CARD" knob without turning the knob in either direction. This will avoid turning the card away from the reading to which it may have been set.

(3) When resetting the instrument in flight, do not uncage (unlock) it by pulling out on the "LOCK AND SET CARD" knob until the aircraft is in level flight.

CAUTION

The Turn Indicator should never be caged (locked) except during maneuvers that may exceed its operating limits or to reset it. (Refer to this section, paragraph 3.) At all other times the instrument should be uncaged (unlocked).

e. CHECKING FOR GYRO DRIFT.

(1) The gyro of the Turn Indicator is not controlled by a directive force like the earth's magnetic field acting on the compass. Therefore, due to the slight amount of normal gyro drift, which cannot be entirely eliminated, the turn indicator card will drift from the original set-in heading.

(2) When the latitude corrector is properly adjusted, the drift of the card should not exceed 3 degrees in 10 minutes on any heading. (Refer to section II, paragraph 2.f.)



Figure 10 - Type C-1 Turn Indicator

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NOTE

If the gyro drift is excessive, the adjustment of the latitude corrector should be checked. When operating 20 degrees or more from the latitude zone for which the corrector was set, there will be an observable increase in the amount of gyro drift.

(3) At periodic intervals of approximately 15 minutes during flight, check the reading of the turn indicator card against the reading of the magnetic compass. If necessary, reset the Turn Indicator.

2A. OPERATING INSTRUCTIONS FOR AF TYPE C-5 AND NAVY DIRECTIONAL GYRO INDICATORS.

a. **STARTING.** - Turning on the aircraft's main power supply switch, or the inverter switch, starts the Indicator. Thereafter, it is ready to be set for use, after allowing approximately 2 minutes for the gyro to come up to speed.

CAUTION

The instrument power supply should include protective devices in accordance with installation regulations. It is recommended that the instrument should be controlled only by the aircraft's main power supply switch, so that any time this switch is closed the a-c circuit is connected to the instrument.

b. CAGING AND UNCAGING (LOCKING AND UNLOCKING) THE INSTRUMENT.

(1) To cage (lock) the instrument, push the "PUSH TO CAGE" knob (figure 10A) in, with a slight rotary motion, as far as it will go, and leave it there. This locks the gyro, making the instrument non-indicating.

(2) To uncage (unlock) the instrument, pull on the "PUSH TO CAGE" knob without turning the knob in either direction. This will avoid turning the pointer or dial away from the reading to which it may have been set.

(3) When resetting the instrument in flight, do not uncage (unlock) it by pulling out on the "PUSH TO CAGE" knob unless the aircraft is in level flight.

CAUTION

The instrument should never be caged (locked) except to set or reset it. (Refer to this section, paragraph 3.) At all other times the instrument should be uncaged (unlocked).

NOTE

The dial of the Type C-5 Directional Gyro Indicator may be reset (connecting gyro) in the caged or uncaged position of the "PUSH TO CAGE" knob. However, the pointer can only be set in the caged position of the knob.

c. SETTING THE INSTRUMENT.

NOTE

The airplane should be flown straight and level on the desired magnetic course while setting the Indicator.



Figure 10A - Navy (Stock No. R88-I-1006-20) Indicator

(1) The card of the Navy Directional Gyro (Stock No. R88-I-1006 and R88-I-1006-20) Indicators (figure 10A) is usually set to agree with the magnetic compass on the heading to be flown. Push the knob all the way in. This locks the gyro making it non-indicating. It is not necessary to retain pressure on the knob to rotate the card if the gyro was caged



Figure 10B - Type C-5 Indicator

when the knob was pushed in all the way. However, if pressure on the knob is required to rotate the card, the caging operation should be repeated. Pull knob straight out (uncage) leaving the card unlocked.

(1A) To set the card of Navy Directional Gyro (Stock No. R8811006-020-000) Indicator, push the "PUSH TO CAGE" knob in as far as it will go, and, with pressure on the knob, rotate it to the right or left until the desired reading on the card is set under the lubber line.

NOTE

The card of the Navy Indicator (Stock No. R8811006-020-000) is similar to the dial shown in figure 10A, except that it has two-degree calibrations.

(2) The pointer of the Type C-5 Directional Gyro Indicator (figure 10B) is generally set to indicate the magnetic course of the aircraft. Inasmuch as both the pointer and the dial may be manually set to any position, the instrument may be used with both the pointer and magnetic course coincident with the upper lubber line, or with the "0" (North) mark of the dial in a vertical position, and the pointer indicating the magnetic course of the aircraft. The procedures for setting the instrument in each case are as follows:

(a) POINTER VERTICAL.

1. Cage the gyro.

2. Rotate the "PUSH TO CAGE" knob until the pointer is vertical. (Coincident with the upper index mark.) It is not necessary to retain pressure on the knob to rotate the pointer if the gyro was caged when the knob was pushed in all the way. However, if pressure on the knob is required to get the pointer to rotate, the caging operation should be repeated.

3. Uncage the gyro, being careful not to rotate the pointer.

4. Rotate the knob until the correct magnetic heading on the dial is aligned with the pointer and the upper index mark.

(b) "0" (NORTH) MARK ON DIAL IN VERTICAL POSITION.

1. With the gyro uncaged, rotate the knob until the correct magnetic heading coincides with the pointer.

2. Cage the gyro.

3. Rotate the knob until the "0" mark on the dial coincides with the upper index.

4. Uncage the gyro.

NOTE

Do not uncage (unlock) the instrument until the aircraft has been returned to straight and level flight.

d. USING THE INSTRUMENT.

(1) After the instrument has been set, the Directional Gyro Indicator may be referred to, the same as the magnetic compass, both for maintaining a straight course and for making turns to a given magnetic course.

e. CHECKING FOR GYRO DRIFT.

(1) The gyro of the Indicator is not controlled by a directive force like the earth's magnetic field acting on the compass. Therefore, due to the slight amount of normal gyro drift, which cannot be entirely eliminated, the directional gyro indicator pointer or dial will drift from the original set-in heading.

(2) If the Indicator is operating properly, the drift should not exceed three degrees in 10 minutes on any heading.

(3) At periodic intervals of approximately 15 minutes during flight, check the reading of the Indicator against the reading of the magnetic compass. If necessary, reset the Indicator.

3. OPERATING LIMITS.

a. The gyro of the instrument is free within the limits (from level flight) to 60 degrees climb or dive, and 60 degrees right or left bank for the Type C-1 and Navy Directional Gyro Indicators, and 85 degrees climb or dive and 85 degrees right or left bank for the Type C-5 Indicators.

b. When entering maneuvers that may exceed these limits, the gyro should be caged (locked). (Refer to this section, paragraph 2.d. for the Type C-1 Turn Indicator, and paragraph 2A.b. for the Type C-5 and the Navy Directional Gyro Indicators.)

c. If the operating limits should accidentally be exceeded while the instrument is unlocked, the indications of the instrument cannot be used until it has been caged (locked) and reset. Do not reset and uncage (unlock) the instrument until the aircraft has been returned to straight level flight.

SECTION V

SERVICE INSPECTION, MAINTENANCE, AND LUBRICATION

1. SERVICE TOOLS REQUIRED.

a. There is only one special tool required for servicing the Type C-1 Turn Indicator and the Navy Directional Gyro Indicators. This is a pin spanner wrench, T100350, which is used for adjustment of the latitude corrector. Type C-5 Directional Gyro Indicator requires no

special tools.

b. In addition to the usual service tools, a voltmeter, a frequency meter, and a phase sequence indicator should be available for checking the power supply. A vibrometer also should be available for checking the vibration of the instrument panel.

2. SERVICE INSPECTION.

NOTE

Inspection periods established for AF and Navy service organizations are not identical. For that reason, inspection periods specified in this section in terms of hours consist of two figures, i.e.: "25-30 Hour Inspection"; the first figure of which indicates the AF periods, and the second figure of which indicates the comparable Navy period. Inasmuch as the Navy inspection periods do not exceed 120 hours, all inspections of longer duration shall be considered as the 2nd, 3rd, 5th, etc., 120-hour inspection.

Daily

Check the "LOCK AND SET CARD" knob or "PUSH TO CAGE" knob for freedom of operation by pushing it in and turning it. Turn the knob sufficiently to rotate the card through a full 360 degrees. Check the "SET COURSE" knob by pushing it in and turning it. While turning the knob, check to see that the course indicator dial rotates freely. Inspect the cover glass for cleanliness and damage.

25-30 HOUR Inspection

Inspect the instrument for broken or loose cover glass. Inspect instrument for security of mounting. Check the voltage, frequency, and phase rotation of the power supply.

50-60 HOUR Inspection

Inspect security of power supply connections. Inspect instrument for discolored or chipped luminous markings.

3. MAINTENANCE.

a. GENERAL.

(1) Any Indicator, if properly installed, should operate satisfactorily for 600 to 800 hours. However, it is advisable to remove the instrument from the aircraft after 300 or 400 hours of use and give it a bench check.

NOTE

Any operations which require opening of the instrument, such as adjustment of the latitude corrector or lubrication (this section, paragraphs 3.b. and 4.) are to be performed only by qualified personnel.

(2) Any trouble encountered probably will be due to improper power supply or to excessive vibration.

(3) As a guide in ascertaining and correcting operational difficulties, refer to this section, paragraph 5.

b. ADJUSTMENT OF THE LATITUDE CORRECTOR OF AF TYPE C-1 AND NAVY INDICATORS.

(1) When the zone of operation of the aircraft is at a latitude which is 20 degrees or more from that for which the latitude corrector is set, the gyro drift will be noticeably increased. Therefore, the latitude corrector should be adjusted to the proper setting so as to minimize the drift of the gyro due to the earth's rotation, the effect of which is zero at the equator and a maximum at the poles.

(2) The latitude corrector (10, figure 2)

is a calibrated nut which may be adjusted in or out on a threaded stud in the gyro housing. Proper positioning of the nut on the stud will minimize gyro drift.

(3) The latitude corrector nut is calibrated to either side of "0" with graduations marked "1" to "7". North latitude graduations are indicated to the left of "0" by the letter "N" and south latitude graduations are indicated to the right of "0" by the letter "S". The numbers "1" to "7" represent the 10th to the 70th degree north or south latitude.

(4) To adjust the latitude corrector, remove the instrument from the panel and disconnect the power supply cable. On the Type C-1 and Navy Stock No. R8811006-020-000 Indicators, break the seal and take off the inspection plate on the side of the case by loosening the screw. Do not attempt to remove the screw entirely. The opening uncovered by the inspection plate will permit access to the latitude corrector. The Navy type Indicators of Stock No. R88-I-1006-20 do not incorporate an inspection plate opening on the side of the case and it is necessary to withdraw the cover assembly unless an inspection plate has already been added. (Refer to Section VI, paragraphs 2.b.(1) and (2).)

(5) With the "LOCK AND SET CARD" or "PUSH TO CAGE" knob out (gyro uncaged), insert the index finger in the opening and rotate the vertical gimbal ring until the latitude corrector nut can be viewed through the opening. Then push the "LOCK AND SET CARD" or "PUSH TO CAGE" knob in, to cage (lock) the gyro in this position.

CAUTION

Be careful not to allow foreign matter to enter the case when performing these operations. If dirt or other foreign matter enters its bearings, the instrument will not operate properly.

(6) Insert the pin spanner wrench in the holes in the latitude corrector nut and carefully rotate it right or left as required to align the proper graduation with the index.

(7) When the nut has been adjusted to the required position, replace the inspection plate, connect the power supply plug to the receptacle on the rear of the case, and mount the instrument in the panel.

4. LUBRICATION.

The shafts and bearings of the instruments are lubricated before assembly and no further lubrication should be required until the instrument is removed for inspection or overhaul.

NOTE

Higher temperatures increase the evaporation of oil. Therefore, when operating in hot climates for extended periods of time, the oil should be replenished approximately every 150 hours of operation. Remove the instrument from the airplane, take off the cover, and lubricate all the accessible shafts and bearings with no more than one drop of gyro instrument oil, Specification No. AN-0-11. Lubrication requires disassembly of the instrument; therefore, this operation may be performed only by qualified personnel.

5. SERVICE TROUBLES AND REMEDIES.

TROUBLE	Probable Cause	Remedy
INSTRUMENT DOES NOT START (CARD OR POINTER FAILS TO RESPOND)	Instrument caged Failure at source of power supply Faulty power supply connections to instrument Faulty internal wiring	Uncage instrument. Check power supply at source. Check power supply cable, plug, and receptacle. Check starting of gyro rotor by removing instrument from panel and taking off inspection plate. If it does not start, replace instrument.
CARD OR POINTER MOMENTARILY PRECESSES RAPIDLY AFTER UNCAGING (UNLOCKING)	Instrument was reset when not in level flight Instrument mechanism defective	While the aircraft is in level flight, cage (lock), reset, and uncage. Replace instrument.
EXCESSIVE DRIFT IN EITHER DIRECTION	Instrument not completely uncaged (unlocked) Faulty power supply connection to instrument Faulty internal wiring Voltage and frequency of power supply incorrect Wrong phase rotation Latitude corrector improperly set Instrument mechanism defective	Defective caging mechanism. Replace instrument. Check power supply cable, plug, and receptacle for opens or shorts. Replace instrument. Check voltage and frequency regulation at source of power supply. (115 volts ± 10 , 400 cycles ± 40 .) Check power supply. Refer to this section, paragraph 3.b. Replace instrument.
CARD OR POINTER SPINS CONTINUOUSLY IN ONE DIRECTION	Operating limits have been exceeded One leg of the 400-cycle supply to the gyro is open	When instrument is level, cage (lock), reset, and uncage. Replace instrument.
CARD OR POINTER DOES NOT MOVE WHEN AIRPLANE IS TURNING	Instrument is caged (locked) Instrument not operating due to failure of power supply, faulty power supply connections or internal wiring Instrument mechanism defective	Uncage (unlock) by pulling out either the "LOCK AND SET CARD" knob or the "PUSH TO CAGE" knob. Check power supply at source. Check power supply cable, plug, and receptacle. Check starting of gyro rotor by removing instrument from panel and taking off inspection plate. If it does not start, replace instrument. Replace instrument.
CARD MOVES WHEN "SET COURSE" KNOB IS TURNED	Instrument mechanism defective	Replace instrument.

SECTION VI

DISASSEMBLY, INSPECTION, REPAIR AND REASSEMBLY

1. OVERHAUL TOOLS REQUIRED.

a. The following tools are required for overhauling the Type C-1 Turn Indicator, the

Type C-5 Directional Gyro Indicator, and the Navy Directional Gyro Indicators. The tools required for overhauling the AF Type C-5C Directional Gyroscopic Indicator are listed in subparagraph c.

<u>TOOL NO.</u>	<u>NAME</u>	<u>APPLICATION</u>	<u>REFERENCE FIGURE NO.</u>
**T100060	Scorsby Base	Provide roll, pitch, and yaw for calibration	-
T100355	Holding Block	Support vertical gimbal	16
T100360	Bearing Remover	Rotor bearings	-
T100363	Extracting Tool	Flange contacts	-
T100371	Bearing Remover	General use	-
T100430	Pin Wrench	Bearing cap adjustment	30
T100503	Turntable	Indicator stability test	-
T100518	Holding Block	Rotor	47
T100542	Spanner Wrench	Bearing cap locknut	29
T100588	Balancing Fixture	Vertical gimbal	27
T100604	Rotor Balancing Machine Adapter	Balance rotor	-
T100663	Run-in Fixture	Rotor	46
T100671	Portable Power Supply Checker	Checking continuity and power supply	-
T100675	Drill	0° chip breaker for rotor used with T100960 or T100800	-
**T100770	Scorsby Table	Holds 8 instruments	-
*T100800	Rotor Balancing Machine	Balancing rotor	-
**T100815	Scorsby Adapter	Mounts instruments to Scorsby Table which holds 8 instruments	-
T100872	Power Supply Checker Adapter	Modifies T100671	-
*T100885	Modification Kit	Modifies T100800	-
**T100925	Scorsby Table	Provides roll, pitch and yaw for one instrument only	-
*T100960	Rotor Balancing Machine	Balancing rotor	-

** T100925 is small Scorsby for only one instrument. T100060 is Scorsby Base requiring table T100770 and adapter T100815.

* T100960 is the recommended alternate for T100800 which can be suitably modified with kit T100885.

b. The following additional tool is required for overhauling the Type C-1 Turn

Indicator and the Navy Directional Gyro Indicators.

<u>TOOL NO.</u>	<u>NAME</u>	<u>APPLICATION</u>
AF P-1	Tester	Checking power supply

c. The following tools and test equipment are required for overhauling the AF Type C-5C

Directional Gyroscopic Indicator. The nomenclature and use of each tool is also given.

<u>SPERRY PART NO.</u>	<u>AF STOCK NUMBER</u>	<u>NOMENCLATURE</u>	<u>APPLICATION</u>
T100770	7CAC-702508	Scorsby Table Top	Holds eight instruments for testing
T100815	7CSG-T100815	Scorsby Adapter	Mounts instruments to Scorsby Table Top T100700
T100925	7CAC-793550	Scorsby Table	Provides roll, pitch, and yaw for one instrument only
1000060	7CAC-058825	Scorsby Base	Provides roll, pitch, and yaw for eight instruments when used with T100770 and T100815
1000334	9DSG-1000334	Drilling And Pinning Fixture	For holding gear shafts while drilling and inserting pins
1000341	9DSG-1000341	Drilling And Pinning Fixture	For holding gear shaft while installing pinion gears
1000342	9DSG-1000342	Drilling And Pinning Fixture	For holding gear rod while drilling and inserting pins
1000343	9DSG-1000343	Loop And Roll Tester	Mechanical and electrical device used to simulate roll and loop motions for test
1000345	9DSG-1000345	Pinning Pliers	For assembling shaft and gear assemblies into frame assembly
1000346	9DSG-1000346	Pin Wrench	For removing and installing nut
1000347	9DSG-1000347	Adjustable Pin Wrench	For turning various lock nuts
1000350	9DSG-1000350	Holding Block	Hardwood block for holding gimbal
1000351	9DSG-1000351	Backlash Adjusting Wrench	For adjusting end play of gear
1000352	9DSG-1000352	Spanner Wrench	For disassembly of shell
1000353	9DSG-1000353	Roll Pin Inserting Punch	For installing roll pins in knobs
1000354	9DSG-1000354	Pulling Tool	For removing wobble shaft assembly
1000355	9DSG-1000355	Tube Pinch-off Pliers	For clamping and sealing pinch-off tube
1000356	9DSG-1000356	Bezel Heating Fixture	Hot plate fixture for heating bezel while soldering bezel glass
1000357	9DSG-1000357	Setting Fixture	For setting disk arm
1000358	9DSG-1000358	Slip Ring Holder Clamp	For holding slip ring assembly during cement curing
1000359	9DSG-1000359	Arbor Press and Adapter	For pressing inner race of rotor bearings in conjunction with an arbor press
1000360	9DSG-1000360	Rotor Run-in Fixture	Used in connection with evacuating equipment for running in gyro rotors

<u>SPERRY PART NO.</u>	<u>AF STOCK NUMBER</u>	<u>NOMENCLATURE</u>	<u>APPLICATION</u>
1000361	9DSG-1000361	Retaining Nut Spanner Wrench	For tightening retaining nut
1000362	9DSG-1000362	End Play Fixture	For adjusting gyro rotor in shell
1000363	9DSG-1000363	Static Balancing Fixture	For balancing gyro unit assembly
1000364	9DSG-1000364	Leveling Switch Setting Fixture	Used in conjunction with microscope for setting leveling switch
1000365	9DSG-1000365	Holding Fixture	For holding shell assembly during disassembly of shell assembly
1000366	9DSG-1000366	Gimbal Ring And Gyro Holding Fixture	For static balancing of gyro gimbal
1000367	2000	Protector Cover	Plastic cover for protecting gimbal contacts during storage
1000369	9DSG-1000369	Arbor Press Adapter	For pressing inner race of rotor bearings in conjunction with an arbor press
1000370	9DSG-1000370	Arbor Press Adapter	For pressing inner race of rotor bearings in conjunction with an arbor press
1000371	9DSG-1000371	Arbor Press Adapter	For pressing inner race of rotor bearings in conjunction with an arbor press
1000374	9DSG-1000374	Wobble Shaft Anvil	Press adapter for installing wobble shaft unit in bezel tube
1000375	9DSG-1000375	Wobble Shaft Punch	Press adapter for installing wobble shaft unit in bezel tube
1000379	6700	Sleeve Sealing Stopper	Metal stopper for sealing sleeve
1000380	9DSG-1000380	Sleeve Locking Spanner Wrench	For locking sleeve to nut
1000382	9DSG-1000382	Wobble Shaft Holding And Heating Fixture	For holding wobble shaft while soldering bellows
1000383	9DSG-1000383	Lock Nut Spanner Wrench	Used with end play fixture for locking lock nut
1000384	9DSG-1000384	End Play Fixture	Used with spanner lock nut wrench for setting correct loading on rotor bearings
1000385	9DSG-1000385	Bearing Aligning Wrench	For aligning bearings, stator, and squirrel cage
1000386	9DSG-1000386	Bearing Aligning Anvil	For aligning bearings, stator, and squirrel cage, and rotor
1000387	7CAD	Balancing Machine Adapter	Consists of metal nozzle and shroud, cradle and drilling fixture, and drilling setting block; used in conjunction with balancing machine for balancing rotor

<u>SPERRY PART NO.</u>	<u>AF STOCK NUMBER</u>	<u>NOMENCLATURE</u>	<u>APPLICATION</u>
1000408	9DSG-1000408	Gyro Running Test Fixture	For checking speed and power of gyro unit.
1000409	9DSG-1000409	Turn and Tilt Fixture	For use in balance and drift tests.
1000410	9DSG-1000410	Gyro Leveling Check Fixture	For use in leveling test.
1000425	9DSG-1000425	Pin Wrench	Used to hold and/or adjust locknut, Part No. 833927.
1000426	9DSG-1000426	Arbor press adapter and anvil	Disassemble bearing retainers, stator, squirrel cage, and gyro ring.
1000427	9DSG-1000427	Setting ring	Aligning Tool for centralizing the Fork and Pin Assembly Part No. 314413.
1000546		Wrench	For locking and unlocking gear lock nuts on gyro unit assembly.

d. The following materials are required for
overhauling AF Type C-5C Directional Gyroscopic

Indicator. The commercial or government des-
ignation of each material is also given.

<u>MATERIAL</u>	<u>COMMERCIAL DESIGNATION</u>	<u>GOVERNMENT DESIGNATION</u>
Sealing Compound	Minnesota Mining & Mfg. Co. EC-1130	None
Glyptal	General Electric 1201	None
Oil	F. E. Andson Oil Co. Windsor Lube L-245X	MIL-L-6085A
Helium	98% purity, dust free, 0.006 milligrams (max) water vapor per liter at one atmosphere (dew point-65°C)	None
Helium-Nitrogen Mixture	85% helium (see above) and 15% nitrogen	None
Grease	Esso Standard Oil Co. Beacon 325	MIL-G-3278
Bakelite Cement	Sperry Adhesive No. 3 (or equivalent)	None
Clear Lacquer	Sperry Finish No. 7178	MIL-L-7178
Flat Lacquer	Sperry Finish No. 207	MIL-L-6805
Western Sealant R 313	Sperry Adhesive No. 12	None

e. When estimating the time between over-
haul periods for Directional Gyroscopic Indi-
cators, consideration must be given to both
calendar time and operating time. The manu-
facturer, therefore, recommends that the Type
C-5 be overhauled either after the expiration
of 18 months of inoperation or after 1000 hours
of operation, whichever occurs first. It is
recommended that the Type C-5C be tested after

the expiration of 18 months of inoperation or
after 1000 hours of operation, and overhauled
if performance specifications are not met. It
is also recommended that the Type C-5C be over-
hauled either after 36 months of inoperation
or 2000 hours of operation, whichever occurs
first. However, this period may be extended
after more operating experience has been ob-
tained.

2. DISASSEMBLY.

a. GENERAL.

(1) The disassembly of the Type C-1 Turn Indicator, the Navy Directional Gyro Indicator, and Type C-5 Directional Gyro Indicator is divided into two main operations; one, the removal of the subassemblies, and two, the disassembly of the subassemblies. These operations are discussed under paragraphs 2.b. and c., respectively, for the Type C-1 and Navy (Stock No. R88-I-1006) Indicators, and in paragraphs 2.bA. and cA. for the Type C-5 and Navy (Stock No. R88I1006 020-000) Indicators. The disassembly of the AF Type C-5C Directional Gyroscopic Indicator is covered in paragraph 2A.

(2) After the subassemblies have been removed, the proper procedure is to overhaul each of them separately. In using this procedure, each individual subassembly is disassembled, repaired, and reassembled as a unit, thereby protecting the delicate parts of each subassembly from loss, dirt, or accidental damage. This procedure also has been found to be the quickest method of overhauling the instrument and should not be changed unless absolutely necessary.

(3) The following general precautions always should be observed when disassembling the instruments:

(a) Keep the parts of each subassembly together, preferably in individual trays or covered containers.

(b) Parts that are similar should be marked, labeled, or identified in some manner so that the assembler will replace them in their original positions.

(c) Handle bearings with tweezers; fingerprints leave deposits of water-soluble salts which cause rust and corrosion.

(d) Keep parts protected from dirt, dust, moisture, or accidental damage.

(4) If at overhaul it becomes necessary to remove any of the self-tapping screws, it is recommended that the hole be drilled with a No. 46 (0.081) drill and tapped with a 0.099-56 tap, and a 0.099-56 x 3/16 screw used to replace the self-tapping screw. This recommendation is necessary because of a tendency for self-tapping screws to strip. Many instruments already have had this modification incorporated at the time of manufacture at the factory; therefore, the recommendation is applicable only to earlier units which may still be in service.

b. REMOVAL OF THE SUBASSEMBLIES OF THE AF TYPE C-1 AND NAVY (STOCK NO. R88-I-1006) INDICATORS.

(1) Remove the lead seal and wire, and take out the two special fillister-head screws, lock washers, and flat washers. (See figure 11.)

(2) Take out the five remaining fillister-head machine screws, lock washers, and flat washers, and withdraw the cover assembly.

(3) Uncage the instrument by pulling out the caging knob, marked "LOCK AND SET CARD".

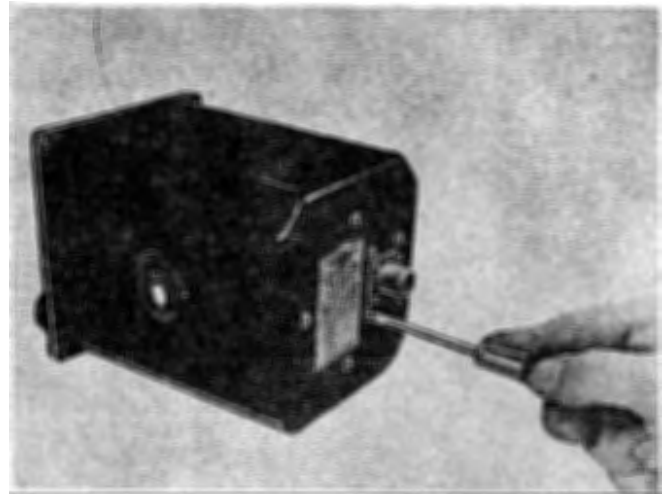


Figure 11

(4) Take out the four fillister-head machine screws and lock washers, and withdraw the front panel assembly. (See figure 12.)

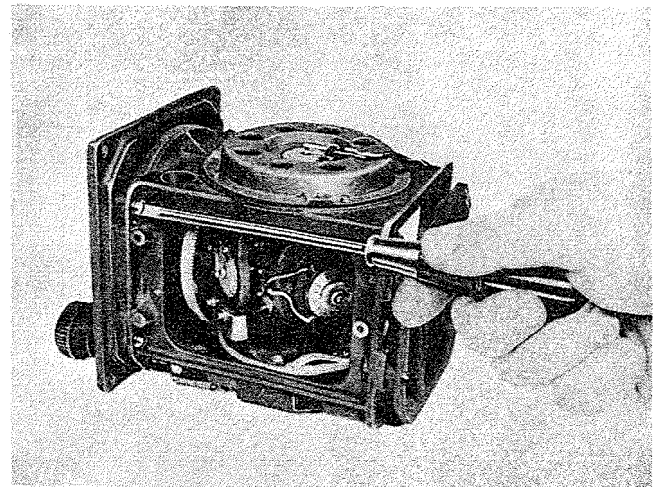


Figure 12

NOTE

On instruments which are equipped with a course indicator mechanism, be careful not to lose the clutch disc, spring, and cup from the course setting shaft.

(5) Take out the four fillister head machine screws and lock washers, and withdraw the dial assembly. (See figure 13.) On instruments which have a course indicator, the flange of the disc assembly (A, figure 13) fits between the dial and the course indicator, and slides out of its bushing when the dial assembly is withdrawn. Place the disc assembly on the course setting shaft until ready for cleaning and inspection.

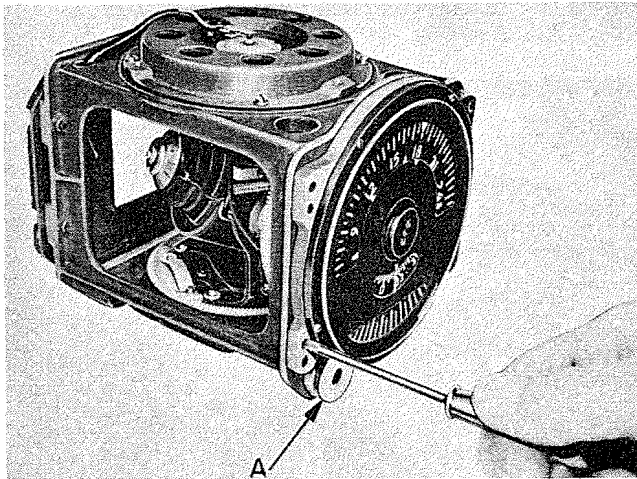


Figure 13

(6) Remove the two fillister-head machine screws from each of the contact assemblies on the top and bottom of the vertical ring. (See figure 14.) Work the contacts and their leads around to the back plate and secure them to the back plate with masking tape to protect them from damage.

(7) Turn the instrument upside down, take out the four fillister-head machine screws and lock washers, and remove the bottom bracket assembly. (See figure 15.) Using bearing puller T100361, remove the bottom bracket bearing and place it in a dustproof container until ready for cleaning and inspection.

NOTE

On some instruments, a clip for holding the bottom contact lead is attached to the bottom bracket by the screw shown being removed in figure 15.



Figure 14

(8) Grasp the gear on the vertical ring and carefully withdraw the vertical gimbal and gyro assembly from the chassis.

CAUTION

Be careful not to damage the contact assemblies, leads, or torque motor winding.

(9) Set the vertical gimbal and gyro assembly in fixture T100355 until ready for further disassembly. (See figure 16.)

(10) Remove the four fillister-head machine screws and lock washers, and take the top bracket assembly off the chassis. (See figure 17.)

(11) Remove the bearing from the top bracket assembly, using bearing puller T100361, and place it in a dustproof container until ready for cleaning and inspection.

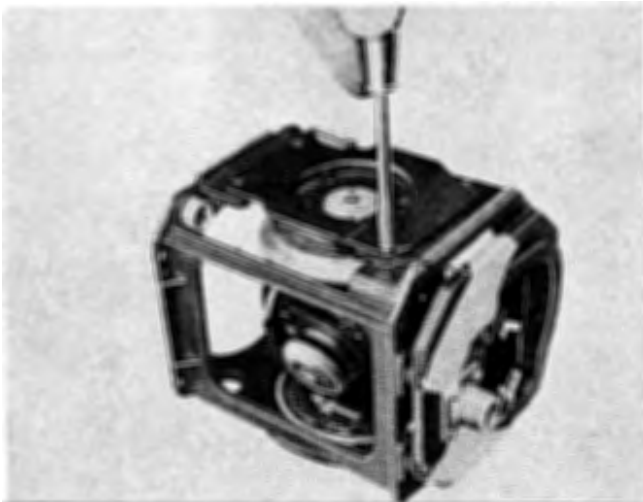


Figure 15

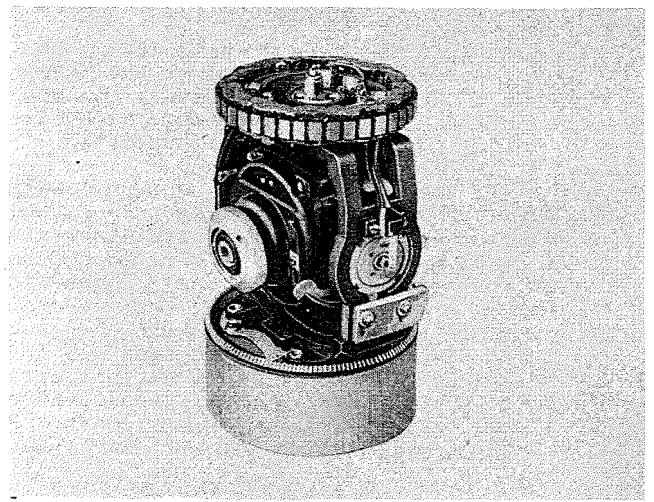


Figure 16

BA. REMOVAL OF SUBASSEMBLIES OF AF TYPE
C-5 AND NAVY (STOCK NO. R88-I-1006-
20 AND R88I1006-020-000 INDICATORS.

(1) Remove the lead seal and wire, and take out the two special fillister-head screws, lock washers, and flat washers. (See figure 11.)

(2) Take out the five remaining fillister-head machine screws, lock washers, and flat washers, and withdraw the cover assembly.

(3) Uncage the instrument by pulling out the "PUSH TO CAGE" knob.

(4) Remove the fillister-head screw from each of the bixel glass heater connections. (See figure 16A.) Remove the paper insulating strips and fiber washers from the terminals, and disconnect the wires.

(5) Take out the four fillister-head machine screws and lock washers, and withdraw the front panel assembly. (See figure 12.)

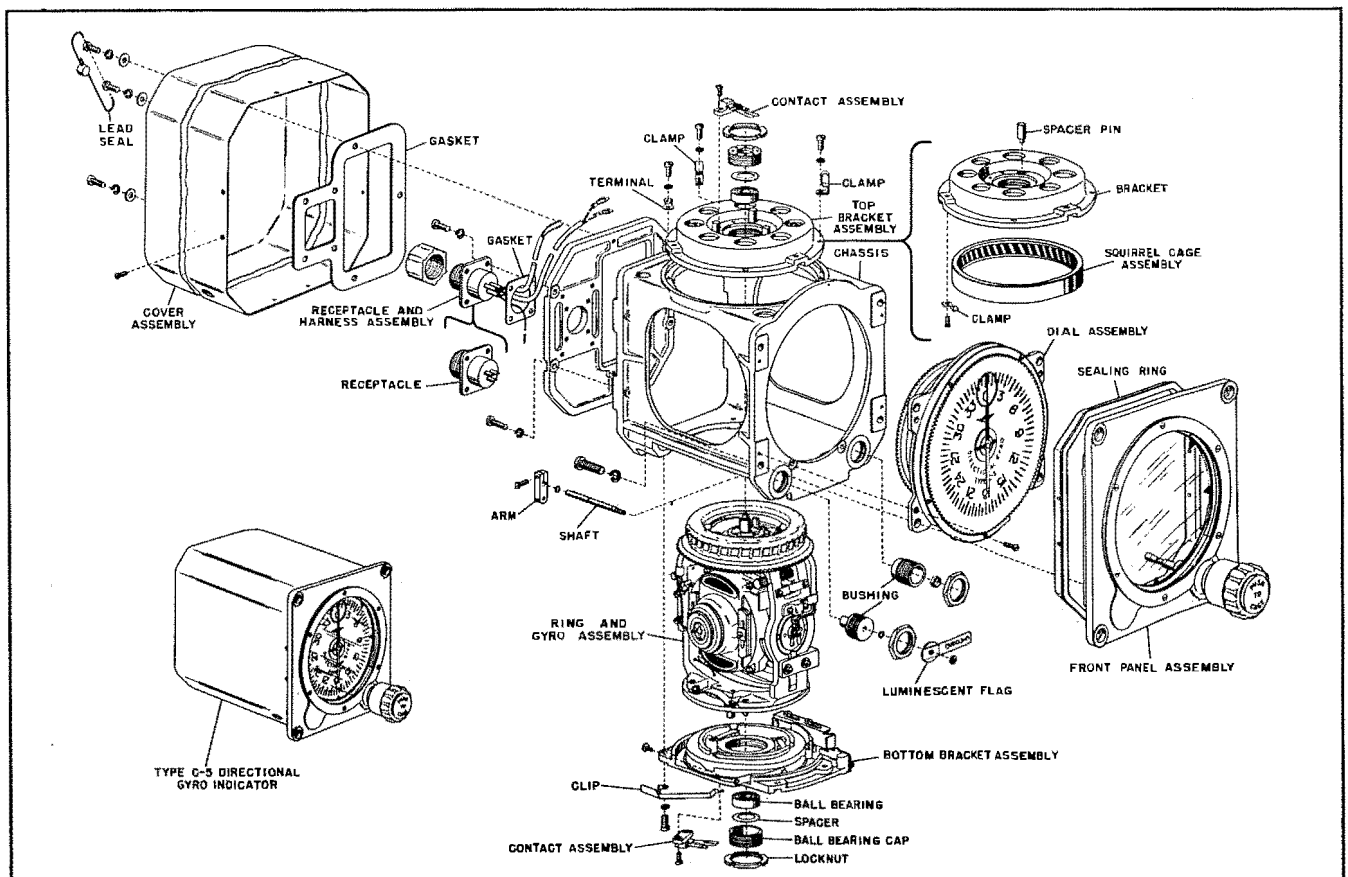


Figure 16A

Note

Care should be taken to avoid losing the small spacer (figure 19A) on the "PUSH TO CAGE" knob shaft. This spacer should be left on the shaft until the assembly is ready for cleaning and inspection.

(6) If the instrument is equipped with a "CAGED" flag, take out the hexagon screw which joins the dural and the flat stainless steel links. Remove the retaining ring at the back end of the bushing from the shaft, then withdraw the flag and shaft assembly from the front, slipping off the dural link and the adjustable lever stop from the shaft. On some C-5 Indicators, an additional arm (link) and coil spring are incorporated; they may be loosened and removed from the caging indicator shaft. Reinsert the hexagon screw into the dural link.

Note

Type C-5 Indicators bearing serial No. 220 and thereafter are fitted with an adjustable lever stop to limit the movement of the flag.

(7) Remove the four flathead machine screws holding the dial assembly to the chassis, and withdraw the dial assembly.

(8) Remove the two fillister-head machine screws holding the contact assembly to the top bracket assembly.

(9) Remove the clip holding the contact assembly leads to the top bracket assembly. Leaving the clip in place on the lead, bend the lead back and tape the contact assembly to the back plate to protect it from damage.

(10) Remove the screws holding the bezel glass heater lead clips to the top bracket assembly, and tape the leads to the back plate of the chassis.

(11) Remove the two fillister-head machine screws holding the contact assembly to the bottom bracket assembly, and the single screw holding the contact lead clip to the bottom bracket assembly. Tape the contact assembly to the back plate to protect it from damage.

(12) With the instrument upside down, take out the remaining three fillister-head screws and lock washers, and remove the bottom bracket assembly. (See figure 15.) Using bearing puller T100361, remove the bottom bracket bearing and place it in a dustproof container until ready for cleaning and inspection.

(13) Grasp the gear on the vertical ring and carefully withdraw the vertical gimbal and gyro assembly from the chassis.

CAUTION

Be careful not to damage the contact assemblies, leads, or torque motor winding.

(14) Set the vertical gimbal and gyro assembly in fixture T100355 until ready for further disassembly. (See figure 16.)

(15) Remove the remaining fillister-head screw and lock washer, and take the top bracket assembly off the chassis.

(16) Remove the bearing from the top bracket assembly, using bearing puller T100361, and place it in a dustproof container until ready for cleaning and inspection.

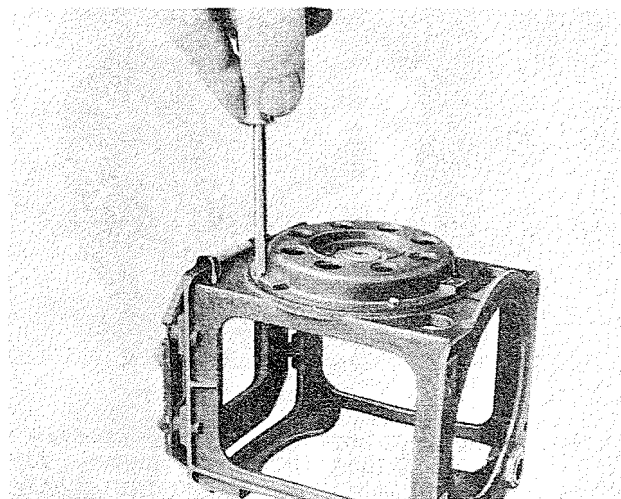


Figure 17

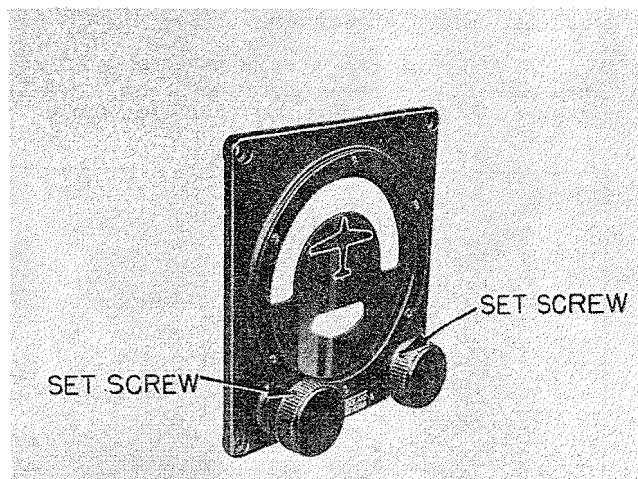


Figure 18

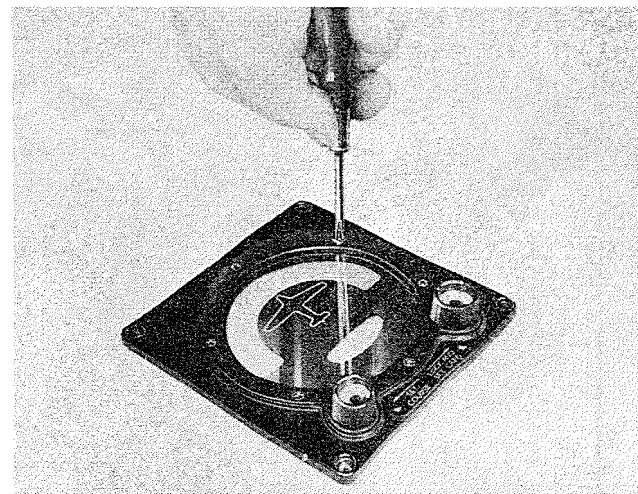


Figure 19

c. DISASSEMBLING THE SUBASSEMBLIES.(1) FRONT PANEL ASSEMBLY OF THE AF TYPE
C-1 AND NAVY (STOCK NO. R88-I-1006)
INDICATOR.

(a) Back out the set screws in the knobs (figure 18) and take off the knobs. Withdraw the shafts. The Navy Indicator is equipped with a single knob and a single shaft.

(b) Take out the six Phillips-head screws and remove the bezel clamp ring, and glass. (See figure 19.) This completes the disassembly of the front panel assembly. (Refer to this section, paragraph 3.c. for the cleaning, inspection, testing, and repair of this subassembly.)

(1A) FRONT PANEL ASSEMBLY OF AF TYPE C-5
AND NAVY (STOCK NO. R88-I-1006-20
AND R88I1006-020-000 INDICATORS.

(a) Pry off the caging knob cover (figure 19A), remove the snap ring and remove the knob from its shaft.

(b) Unscrew the three fillister-head machine screws in the gear and housing assembly

(figure 19A) and slide the housing out as far as it will go on its shaft.

(c) Using a small drift, drive out the taper pin (figure 19A) which holds the sun gear to its shaft, remove the gear from the shaft, and withdraw the shaft from the front panel.

(d) Mark the front side of the bezel glass with a crayon or a small piece of masking tape. Take out the six flathead machine screws in the bezel clamp ring, and remove the ring and the bezel glass.

(e) Do not remove the gasket and the heater contacts unless they are damaged and require replacement. If replacement is necessary, remove the heater contacts after first unsoldering the terminal connections on the inner side of the panel, and then lift out the gasket.

CAUTION

Avoid damaging the transparent coating on the inner face of the bezel glass.

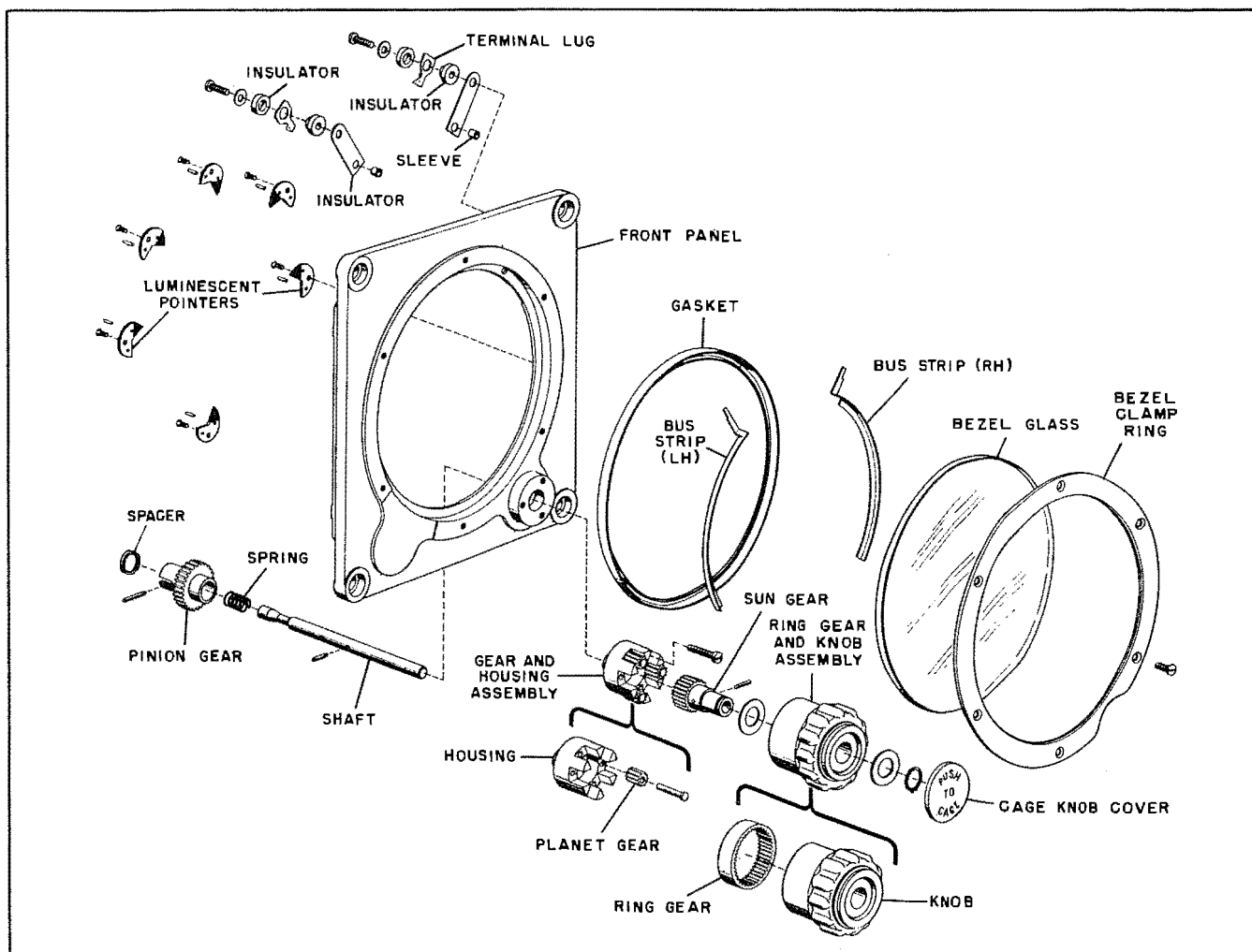


Figure 19A

(2) DIAL ASSEMBLY OF THE AF TYPE C-1
AND NAVY INDICATORS.

(a) Take out the two flathead machine screws (figure 20) and remove the retainer, course indicator, bushing, and spring washer.

(b) Remove the four fillister-head machine screws (figure 21) and lift off the lubber line plate and dial.

(c) Remove the two flathead machine screws (figure 22) and take off the retainer, two spring washers, and gear.

Note

Do not allow the spring washers on the gear end of the shaft to become interchanged with the spring washer on the dial end. The washers on the gear end are the stronger.

(d) Remove the taper pin (figure 23) from the dial hub, and withdraw the shaft and bearings from the dial bracket. (See figure 24.)

CAUTION

Do not remove the gear hub and taper pin from the shaft. This hub is machined for squareness after it has been assembled on the shaft.

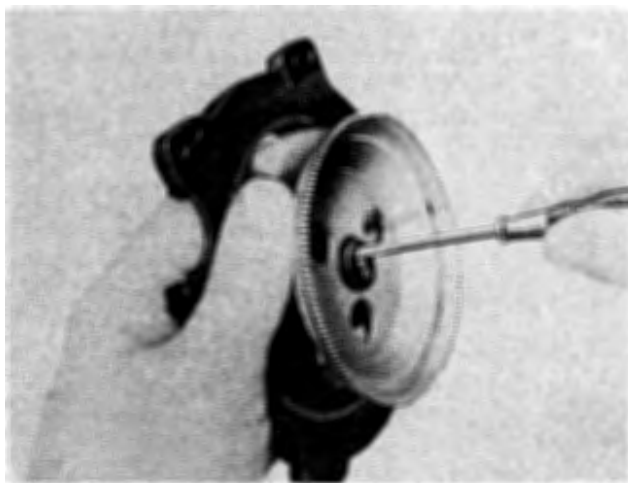


Figure 22



Figure 20

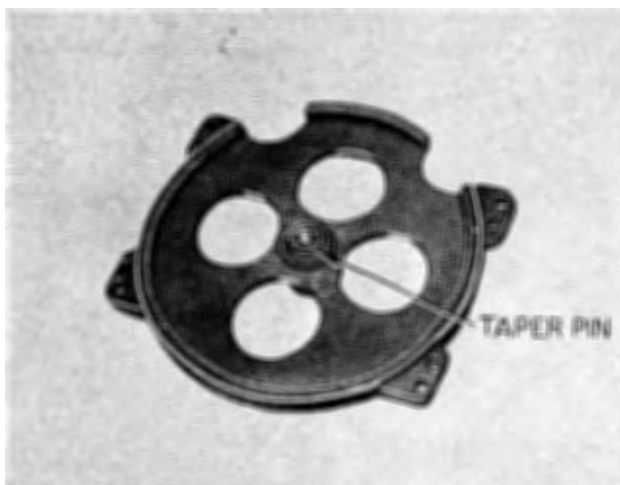


Figure 23



Figure 21

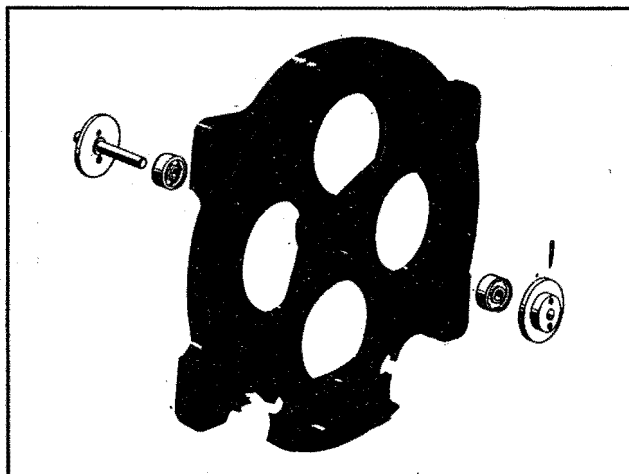


Figure 24

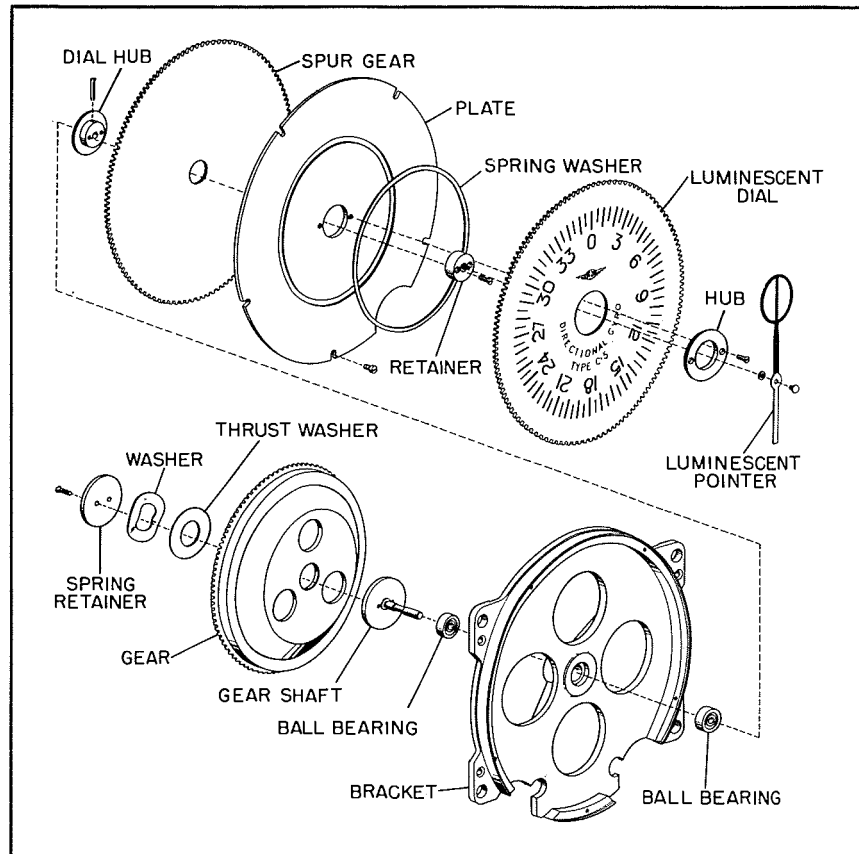


Figure 24A

(2A) DIAL ASSEMBLY OF THE AF TYPE C-5 INDICATOR.

(a) Unscrew the hexagon head screw at the center of the pointer, and remove the pointer and its washer. (See figure 24A.)

(b) Unscrew the two flat head washer screws in the hub, and remove the hub, the dial and the large spring washer. (See figure 24A.)

(c) Unscrew the five fillister-head machine screws around the edge of the plate, and remove the plate. (See figure 24A.)

(d) Remove the two flathead machine screws in the spur gear retainer, remove the retainer and work the large spur gear off its shaft.

(e) Remove the two flathead machine screws in the bevel gear retainer (figure 24A) and remove the retainer, spring washer, flat washer, and gear.

(f) Remove the taper pin (figure 24A) from the dial hub and withdraw the shaft and bearings from the dial bracket.

CAUTION

Do not remove the gear hub and taper pin from the shaft. This hub is machined for squareness after it has been assembled on the shaft.

(3) BOTTOM BRACKET ASSEMBLY OF ALL INDICATORS.

(a) Remove the bearing cap and lock nut, using spanner wrench T100542 and wrench T100430 or T100662.

(b) Unhook the spring (A, figure 25) from the detent plate stud and the caging slide.

(c) Unhook the spring (B, figure 25) from the bracket and the bottom ring.

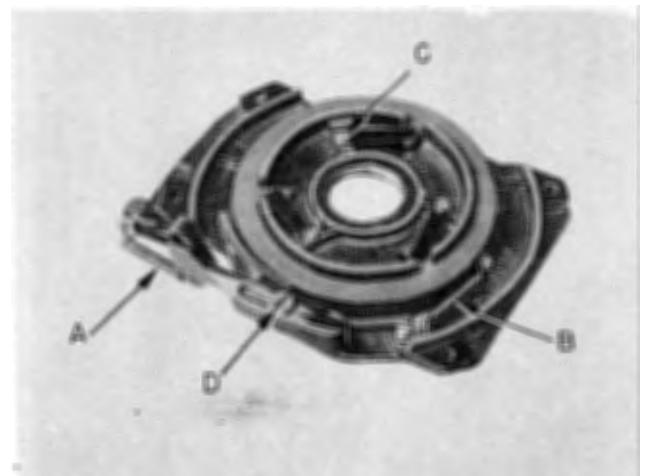


Figure 25

(d) Take out the three special No. 2 self-tapping screws (one of which is shown at C, figure 25) and remove the three flat springs. Lift off the top plate.

(e) Remove the stud (D, figure 25) from

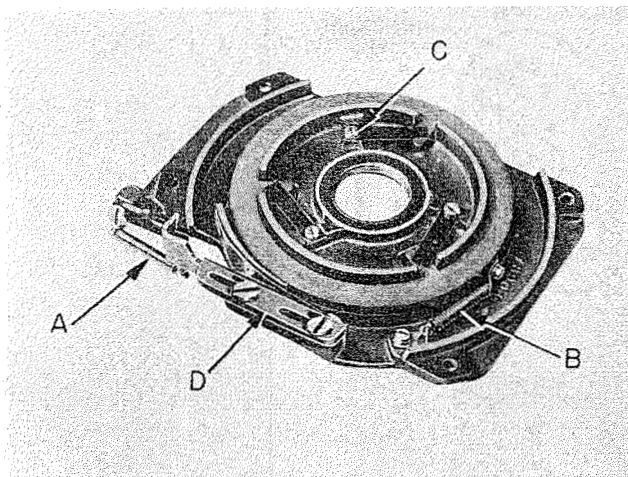


Figure 26

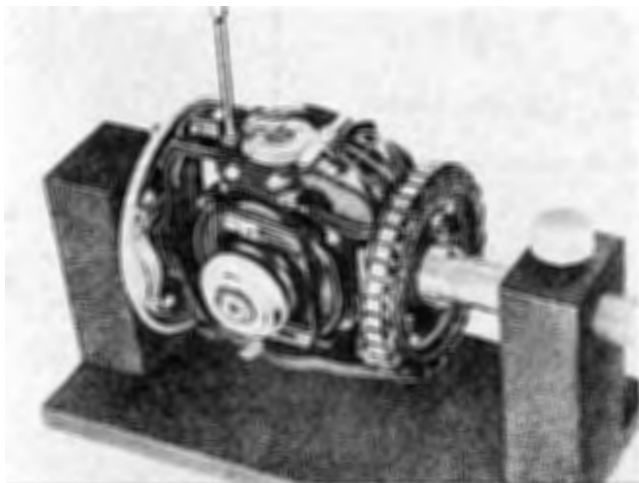


Figure 27



Figure 28

the caging slide and lift off the bottom ring assembly and the two shims (one under the caging slide; the other under the bottom ring). (Refer to this section, paragraph 3.e., for the cleaning, inspection, testing, and repair of this subassembly.

Note

On later instruments the caging slide is guided by two studs and the bottom ring rides on a ferrule (combination thrust-radial bushing). (See figure 26.)

(3A) TOP BRACKET ASSEMBLY OF ALL INDICATORS.

(a) Withdraw three screws and clamps to release the squirrel cage from the top bracket. The spacers on the top are pressfitted. Remove only if damaged.

(4) VERTICAL GIMBAL AND GYRO ASSEMBLY OF ALL INDICATORS.

(a) GENERAL.

1. Mount the vertical gimbal and gyro assembly in fixture T100588. Remove the two fillister-head machine screws (figure 27) from the two contact assemblies on the vertical gimbal, and work the contacts aside.

2. Take out the fillister-head machine screw from each of the multifinger brushes and work the leads aside, being very careful not to break the soldered joint or to damage the brushes in any way. (See figure 28.)

Note

On Type C-5 Directional Gyro Indicator, the brushes are not soldered to their leads, and can be removed separately after the fillister head screws are removed.

3. Using spanner wrench T100542, loosen both bearing cap lock nuts. (See figure 29.)

4. Rotate the vertical gimbal until one of the bearing caps is uppermost. Using wrench T100430 or T100662, unscrew and remove the bearing cap. (See figure 30.)

5. Remove the three fillister-head machine screws and lock washers, and withdraw the flange contact, using extracting tool T100363. (See figure 31.)

CAUTION

Be careful not to damage the threads in the vertical gimbal when removing the flange contact or its screws.

6. Turn the vertical gimbal and gyro over and remove the other bearing cap and flange contact. The gyro then may be withdrawn from the vertical gimbal.

(b) VERTICAL GIMBAL.

1. Remove the vertical gimbal from fixture T100588 and rest it in holding block T100355.

2. Take out the three fillister-head machine screws and lock washers (figure 32) from each of the flange contacts on the top and bottom of the vertical gimbal and remove them.

3. Remove the two ball bearings from the bearing caps, using bearing puller T100371, and place them in a dustproof container until ready for cleaning and testing. This completes the disassembly of the vertical gimbal. Refer to this section, paragraph 3.h.(1), for the cleaning, inspection, testing, and repair of this subassembly.

NOTE

In later models the shoulder in the bearing cap is replaced by a removable spacer. This should be taken out and protected from loss.

(c) GYRO UNIT ASSEMBLY.

NOTE

Before disassembling the gyro unit of the Navy (Stock No. R8811006-020-000) Indicator, it is necessary to unsolder the gyro rotor leads in accordance with the instructions contained in paragraph 2c.(4) (c) 1.

1. PREPARATION OF NAVY (STOCK NO. R8811006-020-000) INDICATOR FOR REMOVAL OF GYRO.

a. Unsolder the three gyro leads (figure 32A).

b. Loosen the stop screw on the compensator weight (figure 37) and unscrew the weight.

c. Remove the three flathead screws (figure 38) and lift off the bakelite ring.

1A. GENERAL.

NOTE

Before disassembling the gyro unit, scribe a line across the joint between the housing and case so that they may be reassembled in exactly the same relation to each other.

a. Remove the four fillister-head machine screws and lock washers (figure 33), and lift the rotor and housing from the case.

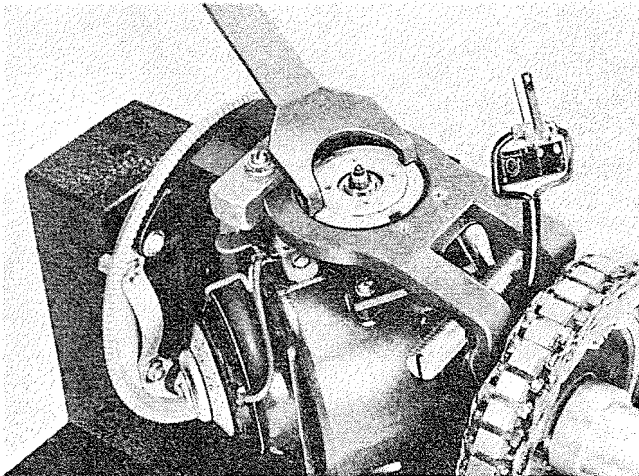


Figure 29

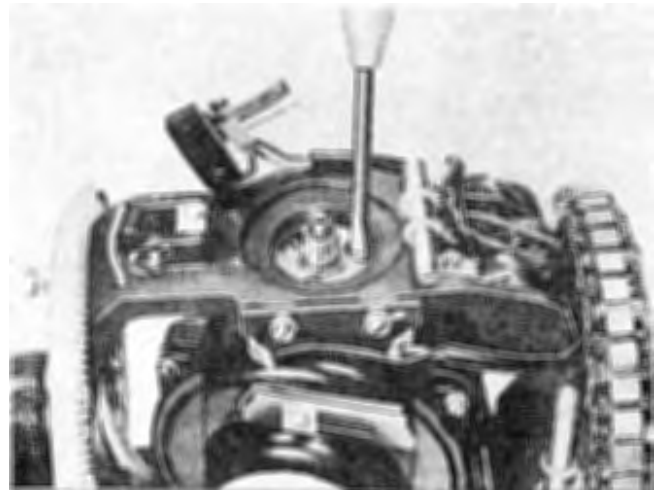


Figure 31

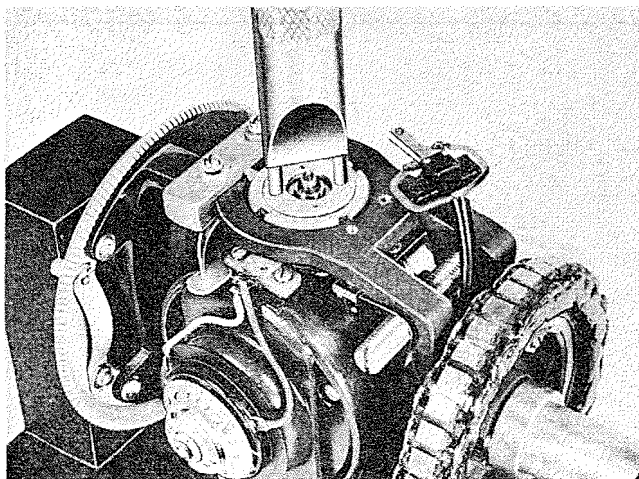


Figure 30

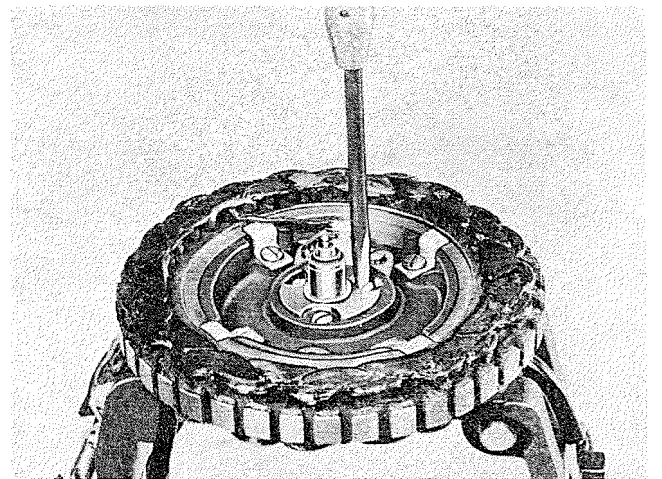


Figure 32

b. Take out the fillister-head machine screw and lock washer (figure 34), and remove the rotor from the housing.

2. ROTOR.

NOTE

Before disassembling the rotor, test it as described in this section, paragraph 4.b.(4)(b). If it operates properly, it should not be disassembled.

a. Scribe a line across the joint between the rotor body and cap, if one is not there already, so that these parts may be assembled in exactly the same relation to each other.

b. Remove the four fillister-head machine screws and lock washers, take off the rotor cap, and withdraw the stator, spring, and bushing. Be sure to label the screws and lock washers so that they may be replaced in their original positions. This will aid in maintaining the balance of the rotor.

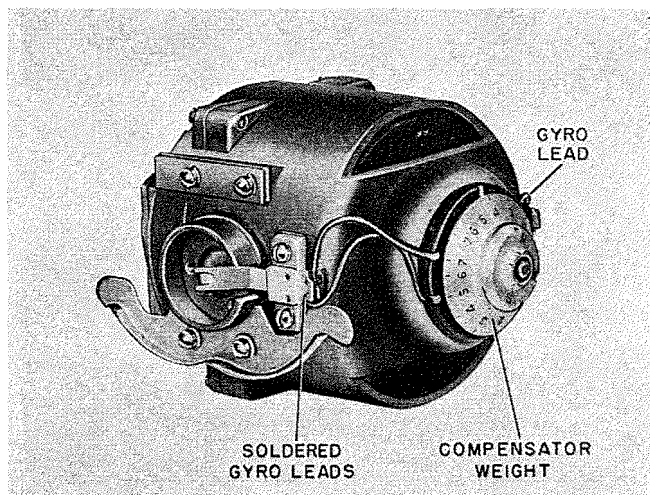


Figure 32A

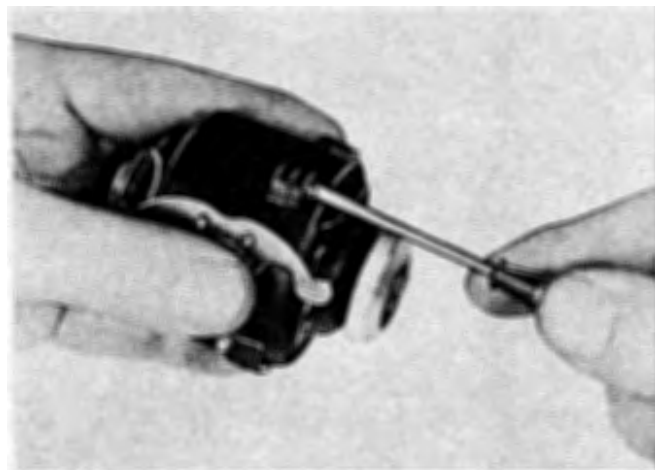


Figure 33

c. Using bearing remover T100360, remove the two ball bearings, and place them in dustproof containers until ready for cleaning and inspection as described in this section, paragraph 3.b.(2)(a). (See figure 35.)

NOTE

In later rotor assemblies the bushing is replaced by two washers. In rotors with greased gearings, two grease retainers and a snap ring are supplied for each bearing. When disassembling, note the order and relative positions of these parts, so that they can be replaced in the proper order. On the Type C-5 and Navy (Stock No. R88-I-1006-20 and R88I1006-020-000) Indicators, the stator shaft is fitted with inner races. (See figure 35A).

3. HOUSING.

a. Remove the oil pad cup and take out the oil pad (figure 36).

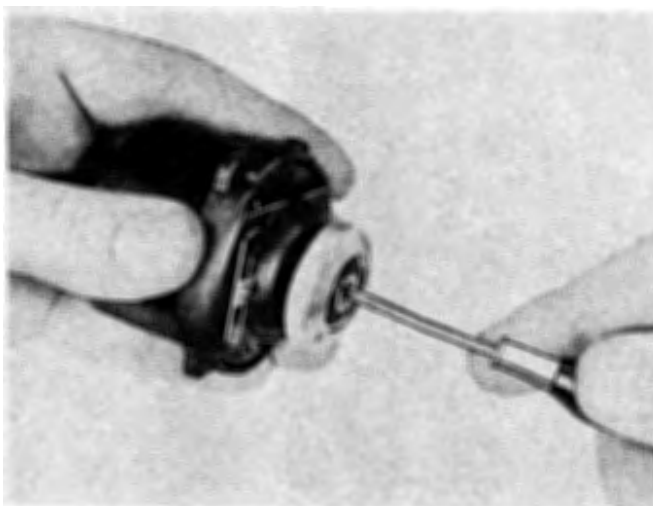


Figure 34

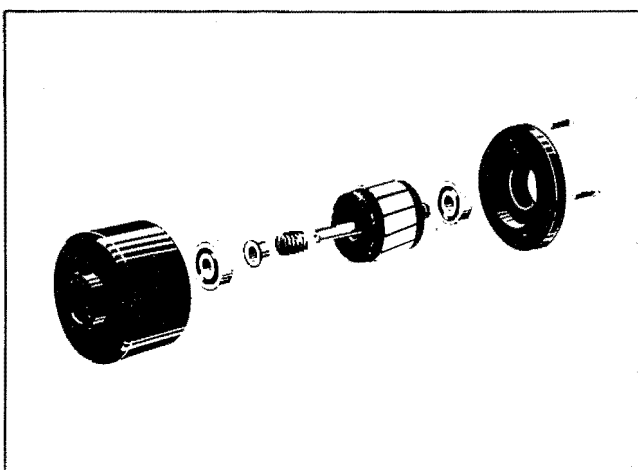


Figure 35

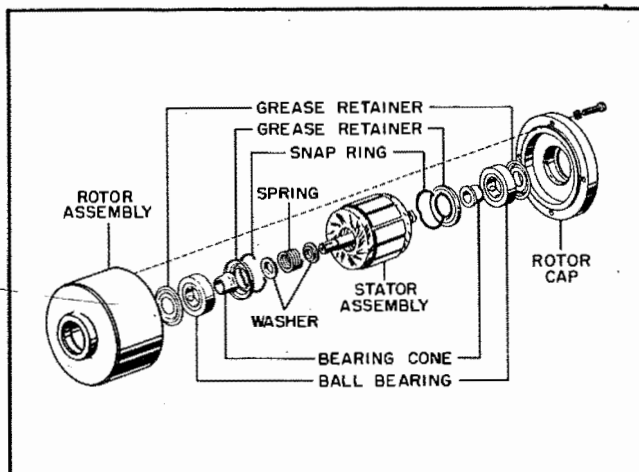


Figure 35A

NOTE

The oil pad assembly of some of the earlier models of the Type C-1 Turn Indicator is equipped with an oil pad retainer. This should be discarded.

b. Loosen the fillister-head clamp screw. Unscrew and remove the threaded ring and locating washer. (Refer to this section, paragraph 3.b.(2)(b) for the cleaning and inspection of this subassembly.)

NOTE

The gyro rotor housing of the Type C-5 and the Navy Directional Gyro Indicators does not incorporate an oil pad. Disassembly of the unit is confined to removing the two flathead machine screws in the drift nut lock washer, and unscrewing the lock washer and drift nut.

4. CASE.

NOTE

Do not disassemble the gyro rotor case of the Type C-5 and the Navy Directional Gyro Indicators. The following instructions apply only to the Type C-1 Turn Indicators, except as noted.

a. Loosen the stop screw on the compensator weight (figure 37) and unscrew the weight.

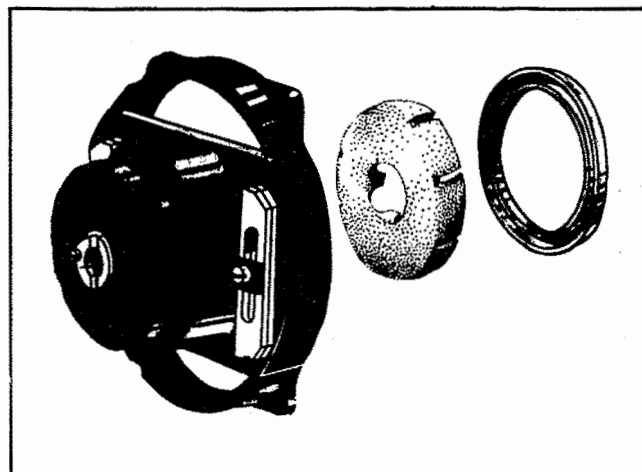


Figure 36

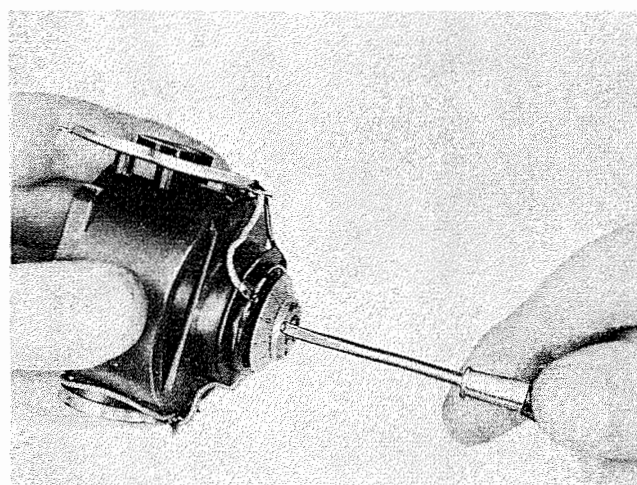


Figure 37

b. Remove the oil pad and cap.

NOTE

The oil pad assembly of some of the earlier models of the Turn Indicator is equipped with an oil pad retainer. This should be discarded.

On Type C-5 Directional Gyro Indicators it is recommended that the wire mesh screens situated on the housing and case assemblies be removed and discarded.



c. Take out the two fillister-head machine screws to release the contact assembly and insulator from the caging cam side of the case.

d. Remove the three flathead machine screws (figure 38) and work the contact assemblies aside. (Refer to this section, paragraph 3.b.(2)(c) for the cleaning, inspection, testing, and repair of this subassembly.)

CAUTION

Be very careful not to break the soldered joints on the remaining connected lead.

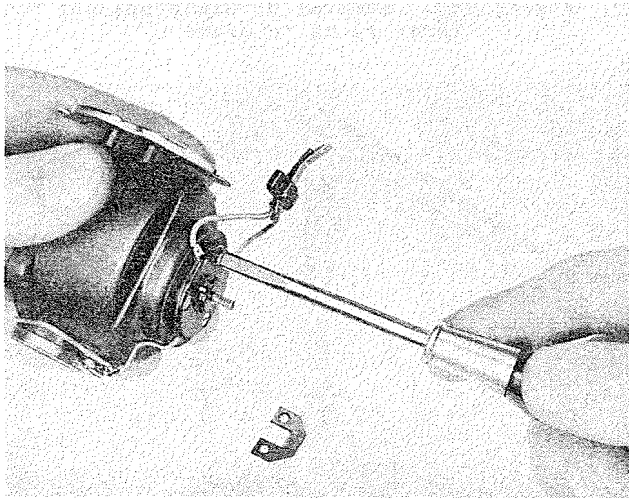


Figure 38

**2A. DISASSEMBLY OF THE AF TYPE C-5C
DIRECTIONAL CYROSCOPIC INDICATOR**

a. GENERAL.

(1) When repairing and overhauling the AF Type C-5C Directional Gyroscopic Indicator it should be tested before disassembly to determine the cause of the failure. Only worn or defective parts need be replaced or repaired.

(2) The disassembly of the AF Type C-5C Directional Gyroscopic Indicator (figure 38A) is divided into two main operations: first, the removal of the five subassemblies of the instrument; and second the disassembly of each. The procedure is given below under subparagraphs b. and c.

(3) The general disassembly precautions given in paragraphs 2.a.(2) and 2.a.(3) should be carefully followed when overhauling the instrument.

CAUTION

Many parts of the instrument are made with very fine threads on them. Extreme care should be taken when removing and handling such parts to protect the threads against damage.

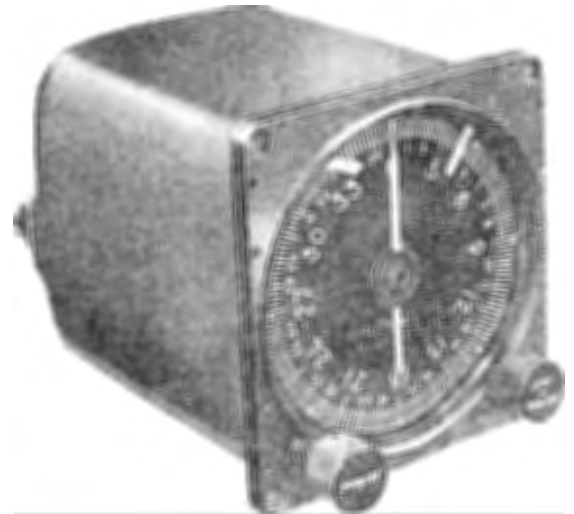


Figure 38A. AF Type C-5C Directional Gyroscopic Indicator

b. REMOVAL OF THE SUBASSEMBLIES.

(1) Take out the three fillister-head screws and lock washers and remove the guard (4, figure 38B) over the pinch-off tube (5). The unit is sealed at one-half atmosphere. Cut off the pinch-off tube with diagonal pliers. This will break the seal.

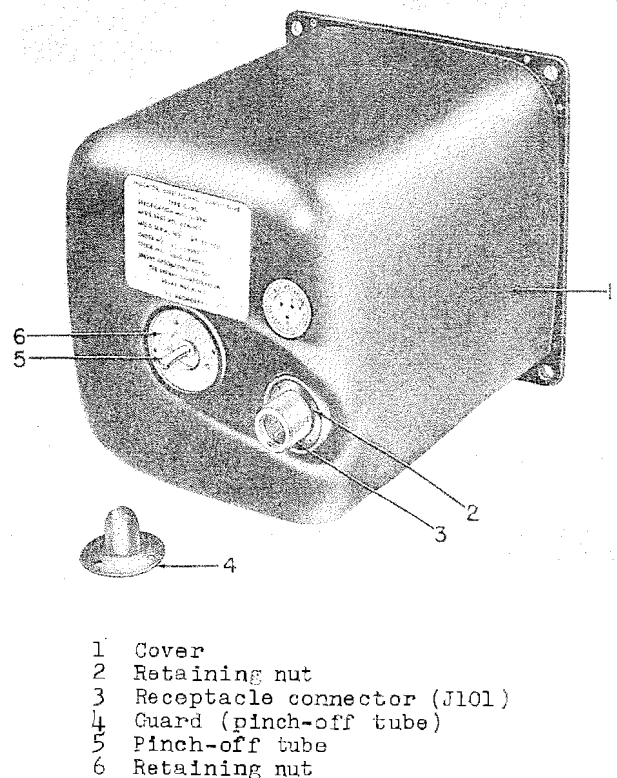
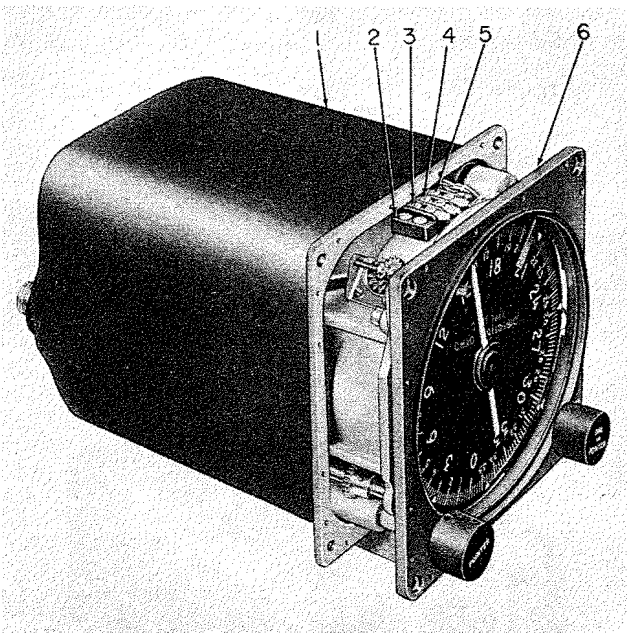


Figure 38B. AF Type C-5C Directional Gyroscopic Indicator, Rear View

(2) Take out the eight (or 16) fillister head screws along the edges of the front bezel (figure 38A) and break the plastic seal between the cover and the front bezel. Use a thin wedge or small knife blade and lightly tap if necessary.

(3) Carefully slide the instrument out of the cover approximately 1-1/4 inches (1, figure 38C). Take out the three binding head screws on the rear of the terminal block (2) and remove the solder lug terminals attached to the red (3), yellow (4), and green (5) wires. Then take hold of the bezel (6) and slide the instrument out of the cover until the cable clamp on the back of the frame (if present) is exposed (figure 38D). Remove the clamp holding the three wires to the frame. The cover can now be completely removed. Lay the cover aside for further disassembly as instructed in subparagraph 2A.c.(1).



- 1 Cover
- 2 Terminal block (TB101)
- 3 Red wire terminal
- 4 Yellow wire terminal
- 5 Green wire terminal
- 6 Bezel

Figure 38C. Removal of Three Rear Wires From Terminal Block

(4) Take out the four fillister-head screws and lock washers attaching the front bezel to the frame and remove the bezel assembly (figure 38E). This is done by pulling the bezel assembly forward and then slightly down so that the bellows will clear the frame. During this operation the two universal couplings will drop out. The bezel assembly is further disassembled, if necessary, as instructed in subparagraph 2A.c.(2).

(5) If the clutch is defective or repairs need to be made to the dial, pointer, or the

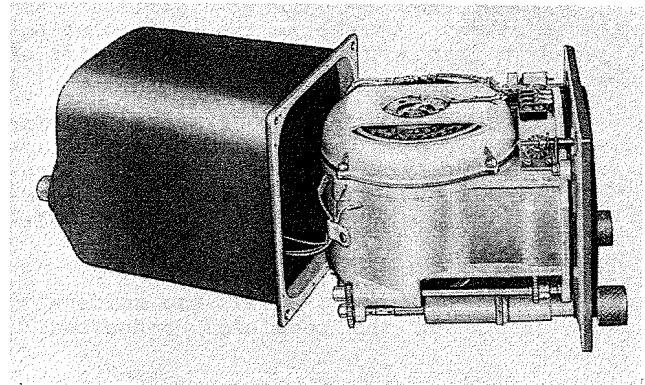


Figure 38D. Removal of Clamp Holding Three Wires to Frame

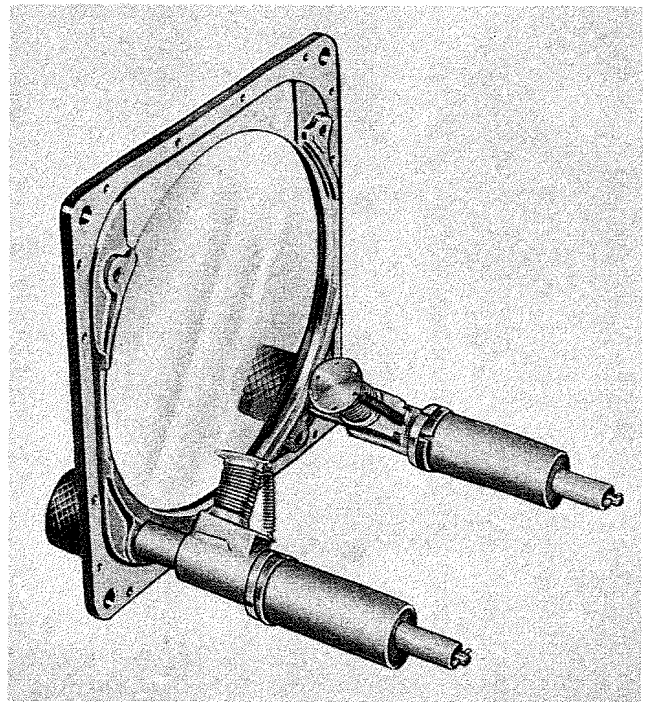


Figure 38E. Bezel Assembly

concealed flag mechanism, unscrew the pointer nut and remove the eight loose 1/16 inch balls (1, figure 38F). Take out the four fillister head screws holding the luminescent bezel (3) and remove the bezel. Next remove the luminescent dial and gear assembly (4). The luminescent pointer and hub (5, figure 38G), luminescent dial and gear assembly (4), clutch disk (3), and dial disk (2) will come off in this operation. The clutch disk (3) is removed from the pointer hub (5) by taking out the three fillister-head screws on the rear of the clutch disk.

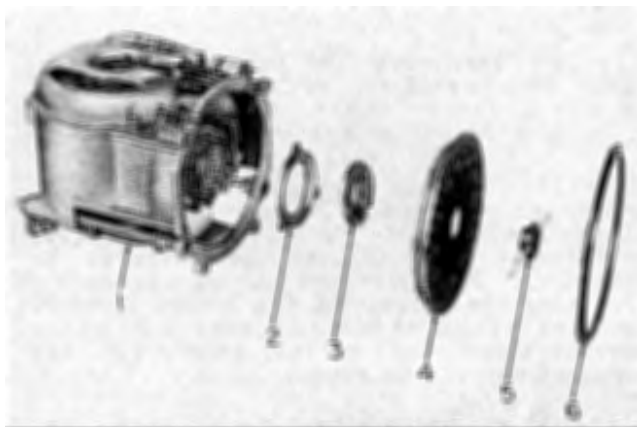
(6) Remove the brush and contact from the holder on the bottom of the unit (5, figure 38H) and the two brushes and contact from the holder on the top (4, figure 38J) to prevent them from being damaged.

(7) To replace a defective coil the spin-down brake may be removed by taking out the



- | | |
|-------------------------------|-----------------------------|
| 1 Steel balls (eight) | 4 Luminescent dial and gear |
| 2 Luminescent pointer and hub | 5 Frame |
| 3 Luminescent bezel | 6 Cap and stator |

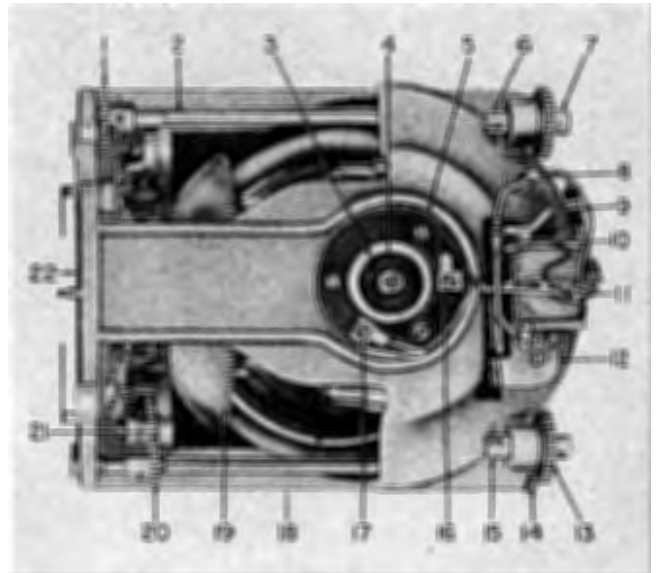
Figure 38F. Dial and Pointer Viewed From Upright Position



- | |
|--------------------------------------|
| 1 Frame assembly |
| 2 Dial disk |
| 3 Clutch disk |
| 4 Luminescent dial and gear assembly |
| 5 Luminescent pointer and hub |
| 6 Luminescent bezel |

Figure 38G. Dial Assembly, Exploded View

three fillister-head screws and lock washers on the armature (8, figure 38H) of the spin-down brake and removing the coil and lamina-



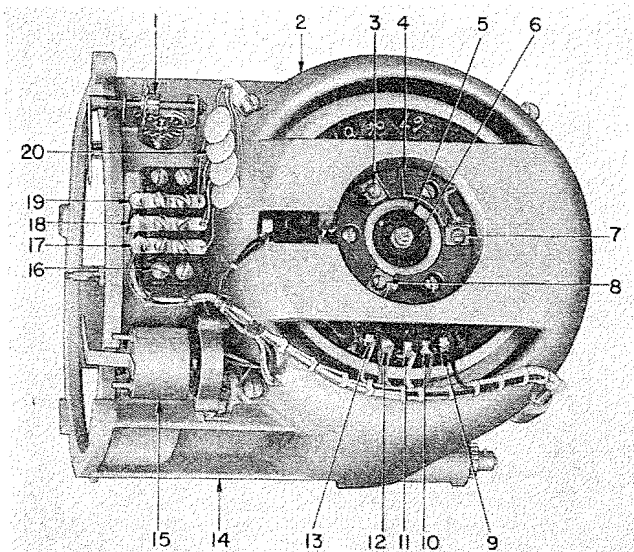
- | |
|--|
| 1 Ball bearing |
| 2 Bearing lock nut |
| 3 Holder |
| 4 Stand off terminal (E109) |
| 5 Stand off terminal (E110) |
| 6 Stand off terminal (E111) |
| 7 Coil and laminations of spin down brake (L101) |
| 8 Armature of spin down brake (L101) |
| 9 Black wire terminal (E107) |
| 10 White wire terminal (E108) |

Figure 38H. Frame Assembly, Bottom View

tions (7). The armature and shims may be laid aside. Unsolder the four leads. Disconnect the yellow lead from the terminal board (TB101-YL), the green wire from the torquer stator (B102-GRN), the blue wire from stand-off terminal E111 (6), and the black wire from stand-off terminal E109 (4). On indicators with serial numbers below 1350, the coil being replaced may be equipped with terminals. If this is so, disconnect the leads from the terminals.

(8) To remove a defective power failure indicator, unsolder the green, yellow, and red wires from the terminals (17, 18, 19, figure 38J) on the terminal block (16). Also unsolder the brown, orange, and black wires (3, 7, 8) from the lugs on the holder (4). Carefully cut only as much lacing as necessary to free the wires from the harness. Lay the assembly (figure 38K) aside for further disassembly as instructed in subparagraph 2A.c. (3).

(9) To replace a defective leveling torque motor stator unsolder the six wires (one black, one, red, one white, two green, and one blue) attached to terminals (9, 10, 11, 12, 13, figure 38J) of the stator (B102). If the wires have not been previously removed from the top brush holder, loosen the holder from the cap by removing the three binding head screws. Take out the four fillister-head screws and lock washers on the cap (2). Lay aside the four disk-type capacitors (20). (On



- 1 Upper bracket of "CAGED" flag assembly
- 2 Cap and stator
- 3 Brown wire terminal (E106)
- 4 Holder
- 5 Bearing lock nut (outer.)
- 6 Bearing lock nut (inner)
- 7 Orange wire terminal (E105)
- 8 Black wire terminal (E104)
- 9 Black wire stator terminal
- 10 Red wire stator terminal
- 11 White wire stator terminal
- 12 Green wire stator terminal
- 13 Blue wire stator terminal
- 14 Frame
- 15 Power failure indicator assembly
- 16 Terminal block (TB101)
- 17 Green wire terminal
- 18 Yellow wire terminal
- 19 Red wire terminal
- 20 Capacitors (C103, C104, C105, C106)

Figure 38J. Frame Assembly, Top View

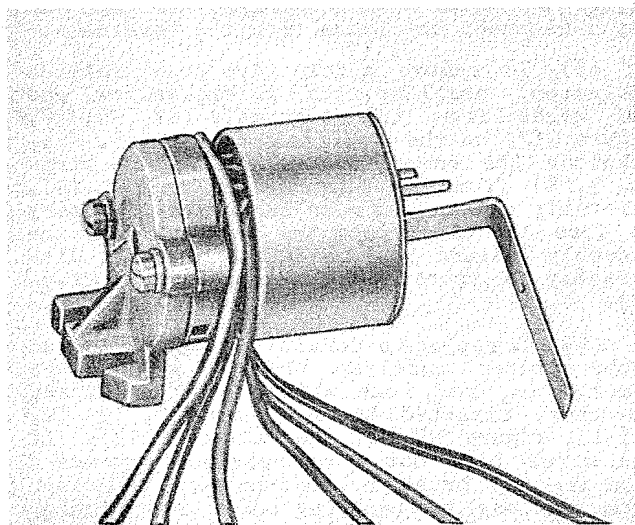


Figure 38K. Power Failure Indicator Assembly.

units with serial numbers below 1900 these capacitors are not used.) Lift the cap to which is attached the gyro and gimbal assembly. Be careful to lift straight up so that the bearing on the lower trunnion of the gimbal will slide out of the frame. Take out the inner nut, using Pin Wrench 1000425, and remove the gyro and gimbal assembly from the cap. Place the gyro and gimbal assembly on hardwood Holding Block 1000350 for further disassembly, if necessary, as instructed in subparagraph 2A.c.(4).

(10) Instead of following the procedure given in (9) above, the gyro and gimbal assembly can be removed from the frame without unsoldering the torquer leads. To do so, remove the two binding head screws holding the power failure indicator to the frame (unless previously removed) and disconnect the wires from the terminal block. Next remove the cable clamp on the back of the frame. Remove the four fillister head screws and lock washers holding the cap. The cap with the gyro and gimbal attached can now be lifted out of the frame letting the wiring harness hinge back. To remove the gyro and gimbal assembly from the cap, take out the inner lock nut, using Pin Wrench 1000425. Place the gyro and gimbal assembly on the hardwood Holding Block 100035 for further disassembly, if necessary, as instructed in subparagraphs 2A.c.(4).

(11) Take out the outer nut (5, figure 38J) on the cap and remove the ball bearing from the cap.

c. DISASSEMBLING THE SUBASSEMBLIES.

(1) DISASSEMBLY OF THE COVER ASSEMBLY.

(a) Take out the retaining nut (6, figure 38B), using Pin Wrench 1000346, holding the pinch-off tube (5), and push the pinch-off tube out of the cover (1).

(b) If it is necessary to replace the electrical connector (3), unsolder from the bottom terminals of the filter (if present) the three leads connecting the filter to the connector. Then take out the retaining nut (2), using the Adjustable Pin Wrench 1000347. The electrical connector with its three attached wires (red, yellow, green) can then be pushed out of the recess.

(c) If it is necessary to remove the filter, remove the nut and lockwasher which fastens the filter clamp to the cover.

NOTE

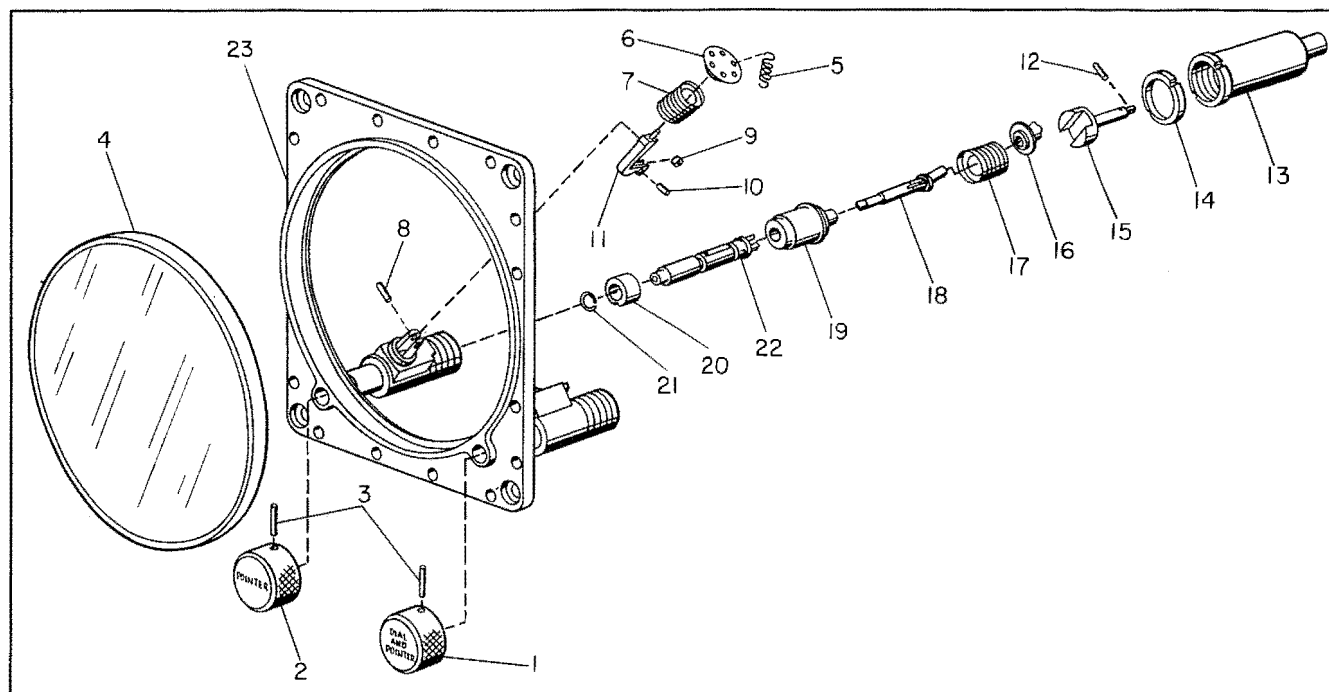
If the three shielded wires connecting the filter to the connector have not been previously removed, unsolder these leads from the bottom terminals of the filter. The filter and attached leads can be completely removed from the cover.

(2) DISASSEMBLY OF THE BEZEL ASSEMBLY.

(a) Before disassembling the bezel assembly check to see that the unit is leak tight and in good mechanical condition. Check the unit for leaks as instructed in paragraph 3A.a.(3). Mount the bezel assembly on the seating surface using a suitable adapter. A leak tight gasket seal must be obtained between the adapter and the bezel. If the bezel assembly fails to meet the leak test requirements it may be disassembled as follows:

(b) The bezel assembly (figure 38L) has two identical shaft assemblies. The disassembly procedure which follows is, therefore, given for only one assembly shaft; the second shaft is disassembled by following the same procedure. Loosen the lock nut (14), using Sleeve Lock Spanner Wrench 1000380, and unscrew and remove the outside sleeve (13), using the same spanner wrench. To remove the output shaft (15) from the outside sleeve (13), take out the pin (12) in the protruding end of the shaft, using a pin pliers.





- | | | |
|-----------------------------------|-------------------|---------------------|
| 1 Luminescent knob (POINTER) | 8 Straight pin | 16 Shaft sleeve |
| 2 Luminescent knob (DIAL POINTER) | 9 Lever roller | 17 Bellows (inside) |
| 3 Roll pin | 10 Straight pin | 18 Wobble shaft |
| 4 Bezel glass | 11 Lever arm | 19 Shaft bushing |
| 5 Extension spring | 12 Straight pin | 20 Shaft sleeve |
| 6 Lever head | 13 Outside sleeve | 21 Retaining ring |
| 7 Bellows (outside) | 14 Lock nut | 22 Knob shaft |
| | 15 Output shaft | 23 Bezel |

Figure 38L. Bezel Assembly, Exploded View

(c) To remove the wobble shaft assembly use the Pulling Tool 1000354. Take hold of the exposed inside bellows (17) by the shoulders at the rear and withdraw it. The bellows may be unsoldered and the shaft bushing (19), the wobble shaft (18), and the shaft sleeve (16) disassembled.

(d) To remove the knob shaft (22) take out the roll pins (3) in the respective luminescent knob (1 or 2) and remove the knob. This will allow removal of the knob shaft (22). The shaft sleeve (20), and the retaining ring (21), may now be removed from the knob shaft, if necessary.

NOTE

Earlier designed units may be equipped with an "O" ring at the end of the knob shaft. If present at overhaul, this "O" ring should be removed and discarded.

(e) Remove the extension spring (5) on the outside bellows (7) and unsolder the bellows. The top of the bellows is soldered to the lever head (6) which is screwed to the

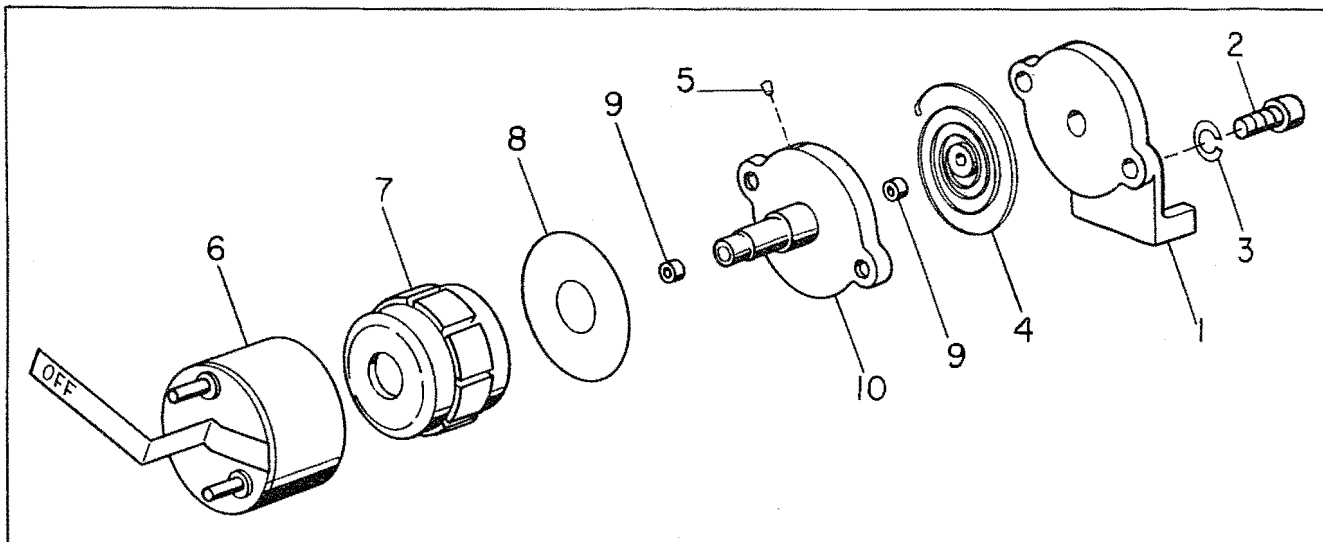
lever arm (11). While the solder is in a molten condition turn the lever head, to permit removing the bellows. The bottom of the bellows is soldered to the bezel tube.

(f) If the lever arm is to be removed (this is not necessary for replacing the glass) take out the straight pin (8) holding the lever arm (11); the arm will then drop out and the lever roller (9) can be removed by taking out the straight pin (10).

(g) Do not remove the bezel glass (4) from the bezel (23) unless the glass is damaged or broken or the hermetic seal between the glass and bezel is faulty. Make repairs at the time of reassembly as instructed in paragraph 4A.b.(2)(a).

(3) DISASSEMBLY OF THE POWER FAILURE INDICATOR ASSEMBLY.

(a) The power failure indicator (figures 38K and 38M) need not be disassembled any further than necessary for replacing the defective part or clearing up the faulty condition. The unit is disassembled as follows:



- | | | |
|--------------------------|--------------------------------|----------------------|
| 1. Mounting bracket | 5. Hairspring wedge | 8. Insulating washer |
| 2. Fillister-head screw | 6. Case (rotor) and "OFF" flag | 9. Shaft bushing |
| 3. Lock washer | 7. Stator | 10. Base |
| 4. Hairspring and collet | | |

Figure 38M. Power Failure Indicator, Exploded View

(b) Take out the two fillister-head screws (2, figure 38M) and lock washers (3) holding the mounting bracket (1) and remove the unit. The outside end of the hairspring (4) is fastened to the base (10) by a wedge (5); the inside end of the hairspring is attached to a collet pressed on the shaft of the rotor (6). Remove the wedge and press the shaft out of the collet. The case (shaft and rotor) will then drop out. The rotor is permanently attached to the shaft. Do not attempt to remove it. The stator (7) may be pressed off the base (10) for replacement.

(4) DISASSEMBLY OF THE GYRO AND GIMBAL ASSEMBLY.

(a) DISASSEMBLY OF GYRO UNIT FROM GIMBAL

1. To remove the gyro unit from the gimbal take out the fillister-head screw holding the solder lug terminal (10, figure 38N) attached to the black wire; also take out the fillister-head screw holding the solder lug terminal (12) attached to the white wire; remove both lugs. Tag the wires for identification so that when the unit is reassembled the wiring will be correctly replaced.

2. Turn the gyro and gimbal assembly completely over and take out the two fillister-head screws holding the two solder lug terminals (4, 13, figure 38P) attached to the red wires; remove the two lugs. Tag the wires for identification so that when the unit is reassembled the wiring will be correctly replaced.

3. It will be necessary to remove the two fixed capacitors C101 and C102 from the gimbal on units with serial numbers below No. 640, before the gyro can be removed. Remove

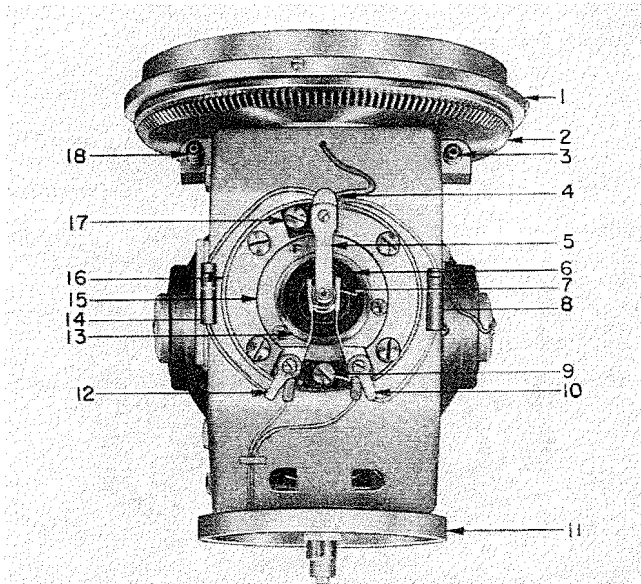
the clamps by taking out the two flat head screws. The nut plate on the inside of the gimbal will fall out. The capacitors need not be reinstalled because resistors will replace them.

4. There are two similar brush assemblies (9, figure 38N and 14, figure 38P) on opposite sides of the gyro and gimbal assembly. To remove them take out the binding head screw holding each to the gimbal. There are also two similar contacts (5, figure 38N and 7, figure 38P) on opposite sides of the gyro and gimbal assembly. To remove the contacts take out the fillister-head screws from the plastic blocks. Remove the blocks by taking out the binding head screws holding them. Tape the contact blocks with adhesive tape to the gimbal.

5. On opposite sides of the gyro and gimbal assembly there are similar adjusting nuts (15, figure 38N and 12, figure 38P); also similar ball-bearing adapters (13, figure 38N and 13, figure 38P), and ball-bearing lock nuts (6, 7, figure 38N and 5, 6, figure 38P). Loosen the three fillister-head screws on the adjusting nuts, and remove the nuts. Also loosen, and remove the two inner ball-bearing lock nuts (one on each side) (6, figure 38N and 6, figure 38P) using Adjustable Pin Wrench 1000347.

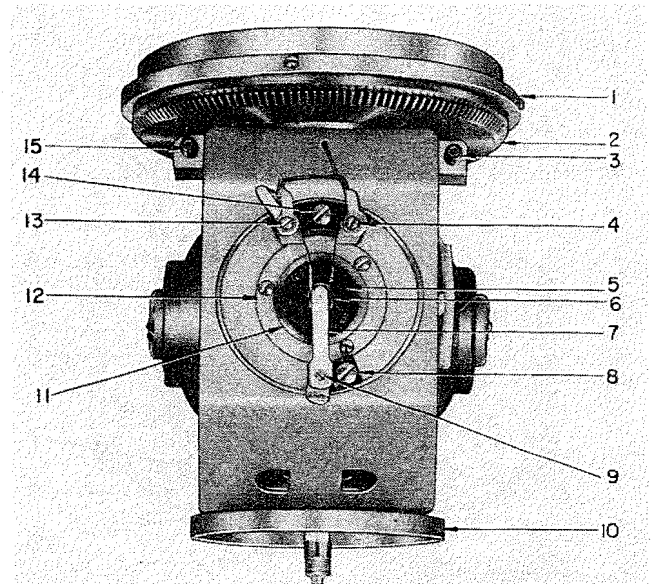
CAUTION

During the next operation support the gyro unit assembly (3, figure 38Q) and handle it very carefully so that it will not drop on the trunnion when the ball bearings are removed. The trunnions have very fine threads which are easily damaged.



- 1 Damper ring
- 2 Bevel gear
- 3 Hex socket balancing screw (gimbal)
- 4 Green wire terminal (E103)
- 5 Contact
- 6 Bearing lock nut
- 7 Bearing lock nut
- 8 Resistor R103
- 9 Brush assembly
- 10 Black wire terminal
- 11 Lower trunnion
- 12 White wire terminal
- 13 Bearing adapter
- 14 Resistor R104
- 15 Adjusting nut
- 16 Bearing adapter
- 17 Contact holder
- 18 Hex nut balancing screw (gimbal)

Figure 38N. Gyro and Gimbal Assembly,
Green Reference Side (E103)



- 1 Damper ring
- 2 Bevel gear
- 3 Hex socket balancing screw (gimbal)
- 4 Red wire terminal (E101)
- 5 Bearing lock nut
- 6 Bearing lock nut
- 7 Contact
- 8 Yellow wire terminal (E102)
- 9 Contact holder
- 10 Lower trunnion
- 11 Bearing adapter
- 12 Adjusting nut
- 13 Red wire terminal (E101)
- 14 Brush assembly
- 15 Hex socket balancing screw (gimbal)

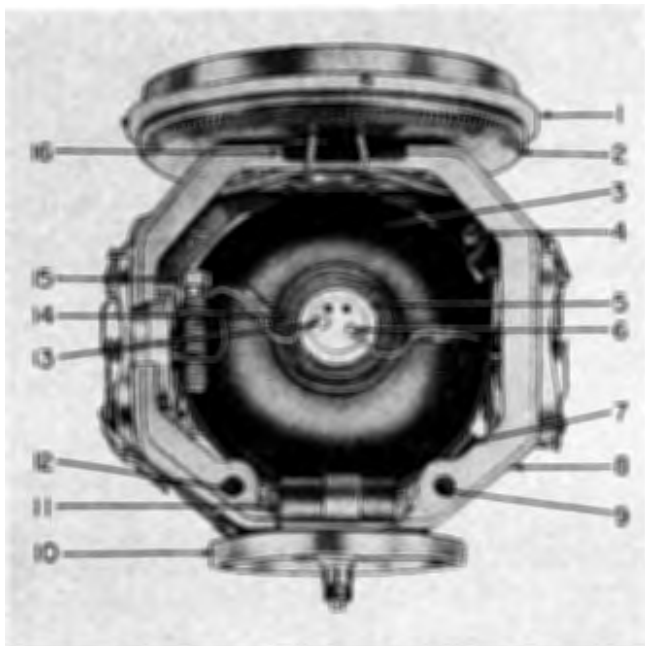
Figure 38P. Gyro and Gimbal Assembly,
Red Reference Side (E101)

6. Unscrew and remove the two ball-bearing adapters (13, figure 38N and 11, figure 38P). Take out the four fillister-head screws and lock washers holding the bearing adapter (16, figure 38N) to the gimbal and slide out the adapter. The gyro unit assembly can now be removed from the gimbal by rotating it slightly so that protruding parts on the gyro unit will clear the gimbal. It may be necessary to remove from the gyro unit the four balance weight screws (4, 7, 15, figure 38Q and 6, figure 38R) to accomplish removal of the gyro unit. When the gyro unit has been removed place it in the Holding Fixture 1000365 for further disassembly as instructed below in subparagraph 2A.c.(4)(b). Place the gimbal in the hardwood Holding Block 1000350, and cover with the Protector Cover 1000367. The ball bearings may be removed from the bearing adapters by loosening the locking nut using two adjustable pin wrenches.

7. It is not normally necessary when overhauling the instrument to remove from the gimbal the upper and lower trunnion or the balance weights and balance screws. If such work must be done, remove the upper gimbal trunnions by taking out the six binding head screws that hold it. The four balance weights are fastened on with flat head screws. The four balance screws can be removed at any time.

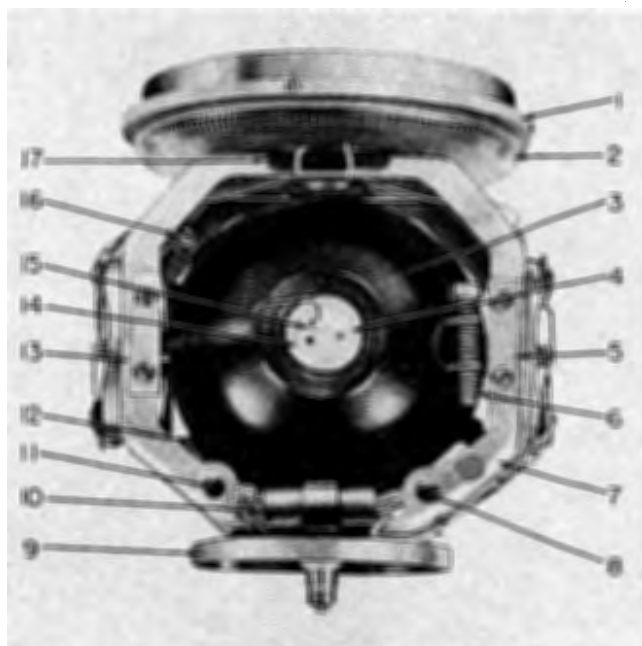
(b) PRE-DISASSEMBLY TEST OF GYRO UNIT.

1. The gyro unit assembly is hermetically sealed. (Figures 38T and 38U). Before the hermetic seal is broken or any disassembly work is attempted the gyro unit should be inspected and tested to determine if repairs are necessary. If the gyro rotor is in running condition it should be tested by measuring the speed of the rotor and the power consumption



- 1 Damper ring
- 2 Bevel gear
- 3 Gyro unit assembly
- 4 Balance weight screw (gyro)
- 5 Terminal cup
- 6 Yellow wire (yellow dot)
- 7 Balance weight screw (gyro)
- 8 Gimbal
- 9 Balancing screw (gimbal)
- 10 Lower trunnion
- 11 Fixed capacitor (C101)
- 12 Balancing screw (gimbal)
- 13 Green wire (green dot)
- 14 Retaining ring
- 15 Fillister-head balance weight screw (gyro)
- 16 Hex socket balancing screw (gimbal)

Figure 38Q. Gyro and Gimbal Assembly, Yellow Dot and Green Dot Side



- 1 Damper ring
- 2 Bevel gear
- 3 Gyro unit assembly
- 4 Terminal cup
- 5 Gimbal balance weight
- 6 Fillister-head balance weight screw (gyro)
- 7 Gimbal
- 8 Balancing screw (gimbal)
- 9 Lower trunnion
- 10 Fixed capacitor (C102)
- 11 Balancing screw (gimbal)
- 12 Balance weight screw (gyro)
- 13 Gimbal balance weight
- 14 Retaining ring
- 15 Red wire (red dot)
- 16 Balance weight screw (gyro)
- 17 Hex socket balancing screw (gimbal)

Figure 38R. Gyro and Gimbal Assembly, Red Dot Side

of the unit. This may be done by placing the gyro unit in the Gyro Running Test Fixture 1000408 and connecting up the unit as shown in figure 38S.

CAUTION

Do not attempt to solder-tack leads to the terminals since the vacuum in the unit will draw the molten solder inside, making it inoperative.

2. Supply power to the gyro rotor through the slip ring. Apply 80.5 ± 2 -volt, 400-cycle, 3-phase power and allow at least five minutes for the gyro rotor to attain its maximum speed. The speed of the gyro is measured by measuring the frequency of the back voltage immediately after the power is turned off. To do this use a Stroboconn (C. G. Conn, Ltd., Elkhart, Indiana) or the equivalent. The speed (frequency) should be 380 revolutions per second, minimum. The power consumption

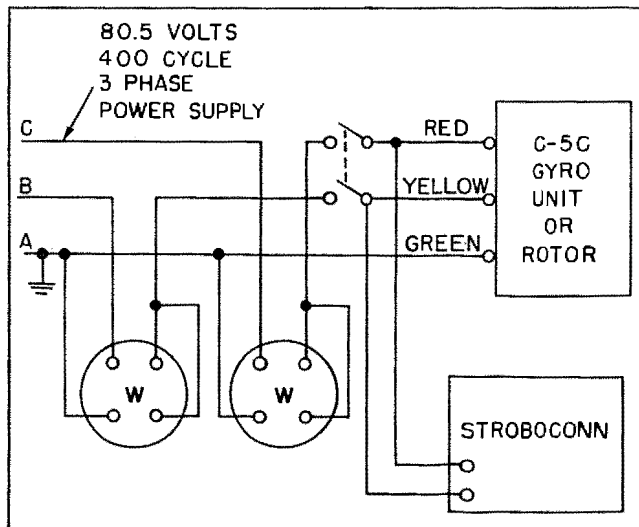


Figure 38S. Set-up for Testing the C-5C Gyro Unit or Gyro Rotor.

(sum of the two wattmeter readings) should be 4.75 watts, maximum (after subtracting the "no-load" wattmeter readings) with the gyro running at maximum speed.

3. High power consumption and low speed may be due to improper atmosphere in the gyro unit because of a leak. The gyro rotor should be tested after it has been removed from the shells as instructed in subparagraph 2A.c.(4)(d).

(c) DISASSEMBLY OF THE GYRO UNIT.

1. If tests indicate the gyro unit assembly (figures 38T and 38U) requires repair the first step in its disassembly is to cut the pinch-off tube (2, figure 38U) to break the hermetic seal. The gyro unit can be disassembled in the following steps.

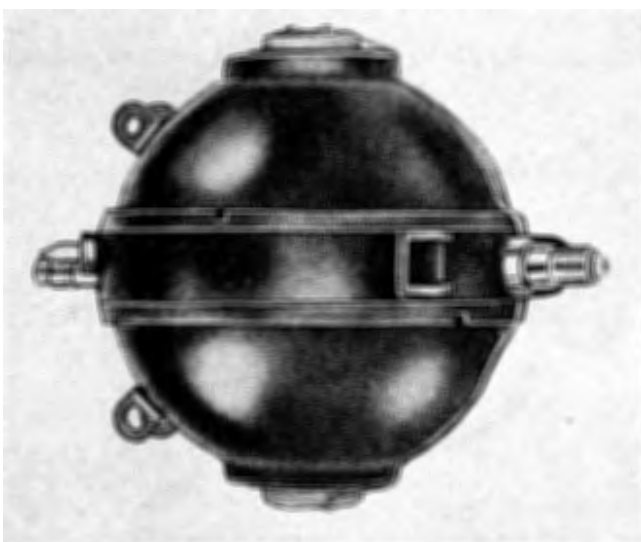


Figure 38T. Gyro Unit Assembly

2. Unsolder the yellow wire (6, figure 38Q) and the green wire (13) attached to the terminal cup (5). Also unsolder from the terminal cup (4, figure 38R), on the opposite side of the unit, the red wire (15). Tag the wires for identification so that when the unit is reassembled the wiring will be replaced correctly. Secure the wires with adhesive tape to the shell.

3. Remove the two retainer rings (5, figure 38U) using Retaining Nut Spanner Wrench 1000361 and take off the terminal cup gaskets (6). The two terminal cups (4) have their rear surfaces coated with sealing compound to produce a hermetic seal. Heat the terminal cups to loosen the sealing compound and remove the cups.

4. Unsolder the electrical jumper wires (7) attached to the inside of the two terminal cups and to the terminal connections on the end of the shaft of the stator (17) (there are two terminals on one end and one terminal on the other end).

5. Using Wrench 1000546, remove the two outside gear lock nuts (10). Next unscrew and remove the shells, using Spanner Wrench 1000352 and Holding Fixture 1000365. The gyro rotor assembly can now be taken out and the two inner gear lock nuts (12), removed. The gyro rotor may be further disassembled as instructed in subparagraph 2A.c.(4)(e). To complete disassembly of the shells remove the pinch-off tube (2).

(d) PRE-DISASSEMBLY TEST OF GYRO ROTOR.

1. If the gyro rotor is in running condition it should be tested before disassembling the unit to determine if repairs are necessary. The gyro rotor, when operated electrically, must be started and run in a controlled atmosphere of dry air, nitrogen, helium, or a mixture of the three at a pressure of 5 to 10 inches of mercury, absolute (20 to 25 inches of mercury vacuum).

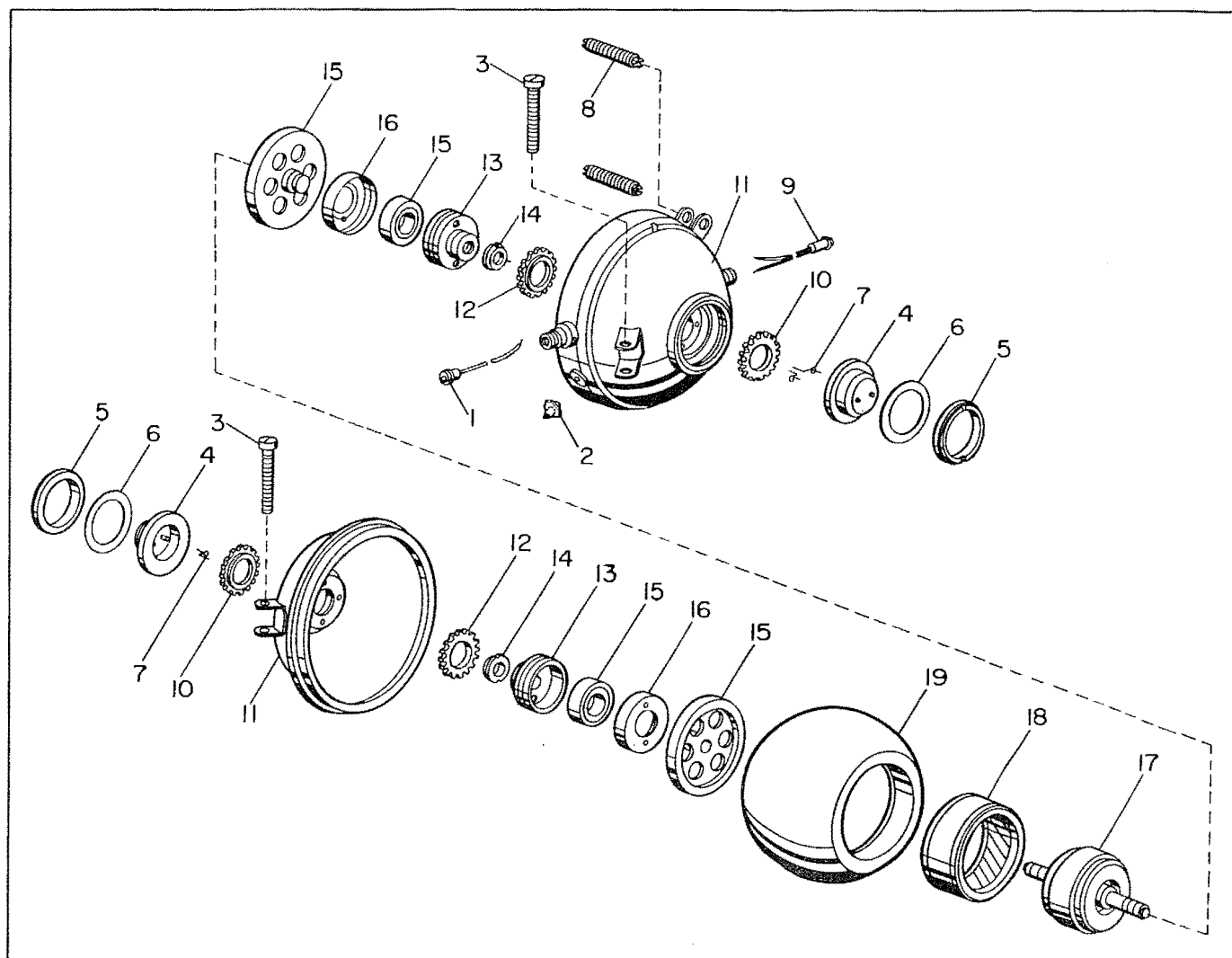
2. To test the gyro rotor place it in the Rotor Run-in Fixture 1000360 and connect up as shown in figure 38S. Apply 80.5 ± 2 -volt, 3-phase, 400-cycle power to the rotor. Once the rotor has reached a speed of 380 revolutions per second (for five minutes) the pressure may be reduced to a full vacuum. The speed should be 386.5 revolutions per second (minimum) as measured using a Strobocorr (C. G. Conn, Ltd., Elkhart, Indiana), or the equivalent, immediately after the power is turned off. The power consumption should be 3.7 watts, maximum, (sum of the wattmeter readings with the power applied to the rotor less the "no-load" wattmeter readings).

(e) DISASSEMBLY OF GYRO MOTOR.

1. If tests indicate the gyro rotor requires repair, proceed as follows: First remove the two lock nuts (14, figure 38U), one on either end of the unit, and then unscrew the two bearing holders (13) and remove the outer bearing lock (16). This will permit removal of the ball bearings (15). Next remove the flanged inner races (15), the squirrel cage (18) and the stator (17) from the gyro ring (19), using Arbor Press Adapter and Anvil 1000426 (Greenard Arbor Press No. 3 or equivalent).

(5) DISASSEMBLY OF THE FRAME ASSEMBLY.

(a) To remove the bevel gear take out the three fillister-head screws and lock washers and unscrew the locking nut (7, figure 38V), using the Adjustable Pin Wrench 1000347. Remove next the bevel gear (5), using the Backlash Adjusting Wrench 1000351, threading the bearing holder in toward the rear end of the frame. The pins of the wrench are inserted through the holes in the clutch flange and into the holes in the bearing holder. Take off the locking nut (11) and clutch flange (6). This will allow removal of the bevel gear (5) and the two ball bearings from the bearings housing.



- | | | | |
|----|--------------------------------|----|-----------------------------|
| 1 | Leveling switch (S101) | 11 | Shell and bracket |
| 2 | Pinch-off tube | 12 | Gear lock nut (inner) |
| 3 | Fillister-head balancing screw | 13 | Bearing holder |
| 4 | Terminal cup | 14 | Lock nut |
| 5 | Retainer ring | 15 | Ball bearing and inner race |
| 6 | Cup gasket | 16 | Bearing lock |
| 7 | Electrical jumper wires | 17 | Shaft and stator |
| 8 | Balance weight screw | 18 | Rotor (squirrel cage) |
| 9 | Slip rings | 19 | Gyro ring |
| 10 | Gear lock nuts (outer) | | |

Figure 38U. Gyro Unit, Exploded View

(b) To remove the upper bracket (1) and "CAGED" flag from the frame take out the two fillister-head screws and lock washers. The removal of the two snap rings and loosening the set screw on the gear will permit complete disassembly.

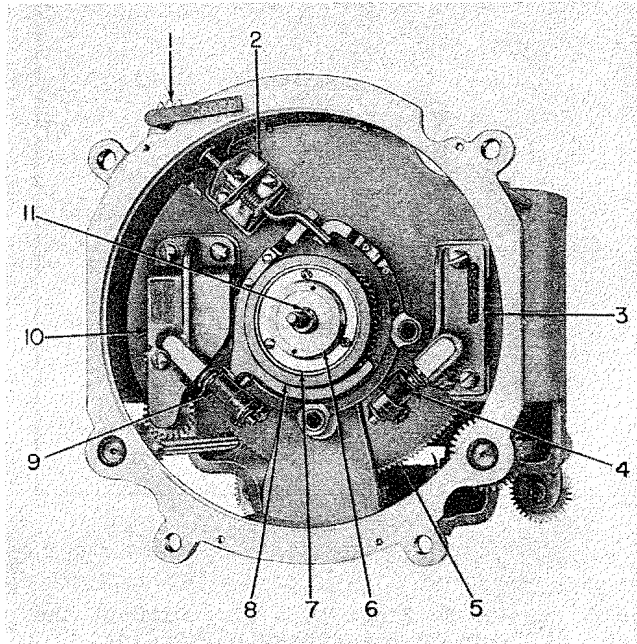
(c) To remove the lower bracket from the frame take out the two fillister-head screws and lock washers. Removing the two snap rings and loosening the set screws in the stop and gear will permit complete disassembly.

(d) To remove bracket (3) holding the outer fork (4) take out the two fillister-

head screws and lock washers. Removal of the retaining ring and the fillister-head screw and lock washers will permit removing the outer fork, the lever, and the spring from the bracket.

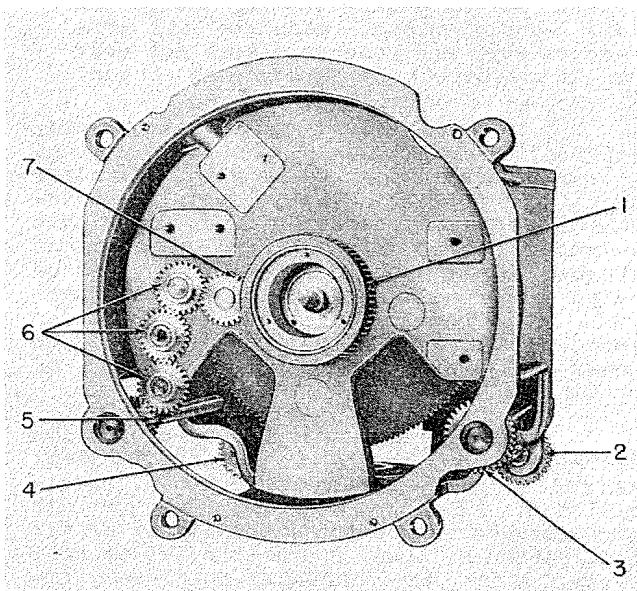
(e) The inner fork (10) can be removed by taking out three fillister-head screws; it can be disassembled as directed in (d), above.

(f) The large bronze gear (1, figure 38W) and four aluminum idler gears (6 and 7) can now be removed. Tag all gears for identification so that when the instrument is reassembled the gears will be replaced correctly.



- 1 Upper bracket ("CAGED" flag)
- 2 Lower bracket ("CAGED" flag)
- 3 Outer fork bracket
- 4 Outer fork
- 5 Bevel gear
- 6 Clutch flange
- 7 Locking nut
- 8 Spur gear
- 9 Inner fork and pin
- 10 Inner fork bracket
- 11 Locking nut

Figure 38V. Frame Assembly, Front View
Showing Inner and Outer Forks

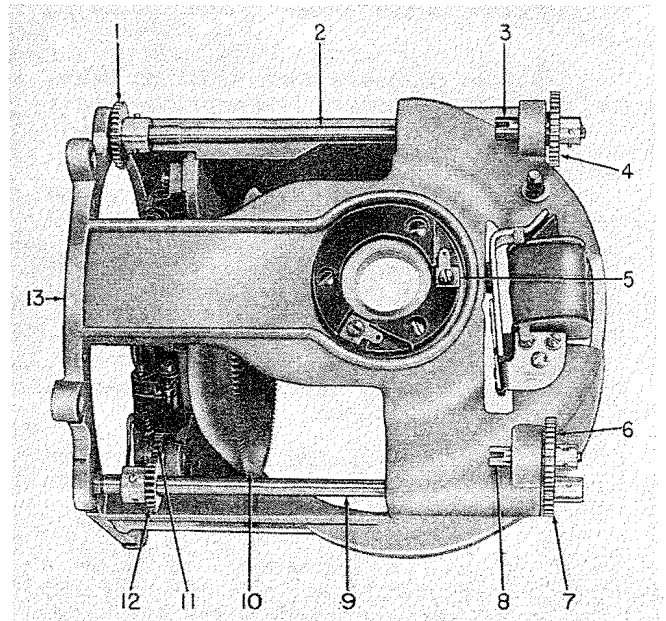


- 1 through 7 Spur gears

Figure 38W. Frame Assembly, Front View
Showing Spur Gears

(g) To remove the short shafts at the rear of the frame take out the two pins holding the spur gears (4, 6, figure 38X). To remove the long through shafts (2, 9) take out the pins holding the gears. Tag all gears for identification so that when the unit is reassembled the gears will be replaced correctly.

(h) The brush holder (5, figure 38X) on the bottom of the frame is secured with three screws.



- 1 Spur gear
- 2 Shaft (long)
- 3 Shaft (short)
- 4 Spur gear
- 5 Holder
- 6 Spur gear
- 7 Spur gear
- 8 Shaft (short)
- 9 Shaft (long)
- 10 Bevel gear
- 11 Spur gear
- 12 Spur gear
- 13 Frame

Figure 38X. Frame Assembly, Bottom View
Spur Gears and Shafts

3. CLEANING, INSPECTION, TESTING, AND REPAIR.

NOTE

For cleaning, inspection, testing and repair of the AF Type C-5C Directional Gyroscopic Indicator see paragraph 3A.

a. GENERAL REPAIR OPERATIONS.

(1) LUMINESCENT MARKINGS.

(a) Normally, luminescent markings will need only cleaning to restore them to their original condition. Surface dust and dirt may be removed with a pencil eraser.

(b) If the luminescent markings have become greasy, the surface should be washed with kerosene and a cloth. This should be followed by pure white soap and a damp cloth, and then by a clean damp cloth without soap.

(2) BALL BEARINGS.

(a) GENERAL.

1. Bearings constitute one of the most important factors in the proper functioning of the Turn and the Directional Gyro Indicators.

2. The most important condition for the proper operation of a bearing is cleanliness. The bearing must be perfectly clean. To obtain cleanliness observe the following cautions:

a. Use tweezers when handling bearings or parts of bearings; fingerprints leave deposits of water-soluble salts which cause rust and corrosion.

b. Never leave bearings in the open; keep them under dustproof covers.

c. Never leave bearings unoiled. They must be protected from moisture at all times.

d. At all times; the bearings must be kept away from emery dust, lead, aluminum, brass, or steel particles.

e. Avoid extensive inspection operations which unduly expose the bearing to dirt and moisture.

3. If it is necessary to renew a bearing, make certain that the new bearing has the same part number as the one being discarded. (The part number is not found on the bearing itself but on the jar in which the replacements are packed. See the parts catalog for the proper replacement part number.)

NOTE

The inside and outside diameters of bearings that have been packed in the same jar may vary somewhat; therefore, it may be necessary to try several bearings before one is found that will fit both the recess and the shaft with a light fingerpress fit.

(b) CLEANING AND TESTING.

1. Submerge the bearing in cleaning solvent, Federal Specification No. P-S-661a, and while holding the inner race, rotate the outer race so that all parts are flushed thoroughly. Allow the bearing to drain, or blow it dry with clean, dry, low-pressure air.

2. To test the bearing for smoothness and freedom, place the clean, dry bearing on a punch or other suitable pivot held vertically. With light pressure of the finger, slowly rotate the outer race. (See figure 39.) The bearing should feel smooth and free. Any feeling of grinding, grating, or roughness will indicate the presence of dirt, grit, or defects which will have to be removed. As a further check, lightly spin the outer race and note how it comes to rest. The outer race

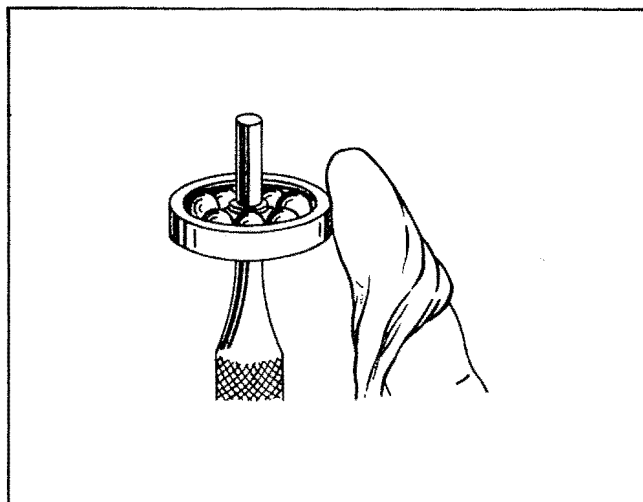


Figure 39

should appear to float to a stop without the slightest trace of stickiness or binding.

3. Should there be any tendency toward binding, wash the bearing and test it again. If still sticky, discard it.

(c) LUBRICATION.

1. Oil in bearings is principally for protection against rust. One drop of oil into the balls and races is usually sufficient; however, the entire bearing must be protected with a film of oil.

NOTE

For applying oil, a 2cc hypodermic syringe has been found to be most effective. It is easily washed, keeps the oil supply clean, measures oil more accurately, and reaches places not normally accessible with an ordinary oil can.

2. A supply of gyro instrument oil, Specification No. AN-O-11, should be kept at the work bench in a clean glass container with a tight fitting cover. Keep the container in a definite place and take care that its contents are never stirred, shaken, or disturbed in any way. In this way any dust or foreign matter will settle, and a clean layer of oil will remain on top. Keep the jar covered. The contents of the jar should be renewed frequently to preclude the use of contaminated oil.

3. If bearings are not to be used immediately, they should be placed in glass jars filled with gyro instrument oil, Specification No. AN-O-11, provided they are not to be stored under extreme conditions or for a long period of time. Under the latter conditions, store the bearings completely immersed in Rust Veto "N" (E. F. Houghton Co., Philadelphia, Pa.).

4. Grease-packed bearings, after thorough cleaning, should be re-lubricated with 75 to 100 milligrams of AN-G-25 grease.

This type of bearing should be kept in the original containers until needed.

(3) SOLDERED CONNECTIONS.

CAUTION

When making soldered connections be extremely careful not to drop solder, rosin, or foreign matter of any kind into the instrument. After soldering, inspect for particles that may have fallen into the instrument.

(a) In making soldered connections use only rosin core solder.

(b) After soldering, thoroughly clean the parts with alcohol to remove any rosin.

(c) The wire must be secured mechanically before soldering.

(d) The insulation must not be charred or removed farther back than 1/16 inch from the soldered connections.

(e) All soldered connections in receptacle prongs where the wire can not be secured mechanically should be given a 10-pound pull test after the wires have been soldered.

b. COVER.

(1) Wash the cover in cleaning solvent, Federal Specification No. P-S-661a, and dry thoroughly. Touch up any chipped or scratched surfaces with dull black lacquer.

(2) Check to see that the edges of the cover are straight and smooth, that the sides are not dented, and that the inspection plate and gasket are in good condition.

(3) Examine the inspection plate gasket for stretching or mutilation. Renew if necessary.

c. FRONT PANEL ASSEMBLY OF THE AF TYPE C-1

AND NAVY (STOCK NO. R88-I-1006)
INDICATORS.

(1) Wash the clutch disc, gear, and shafts in cleaning solvent, Federal Specification No. P-S-661a, and inspect them for burrs or other defects.

(2) Inspect the felt washers in the panel to see that they are held securely by their retainers. If the washers are dry, add one drop of gyro instrument oil, Specification No. AN-O-11, to each.

(3) Inspect the rubber sealing ring to see that it is not stretched or mutilated.

(4) Inspect the knob set screws, and renew if damaged in any way.

(5) Inspect the gasket for stretching or buckling, and renew if necessary.

(6) Inspect the black paint on the panel. Touch up any scratches with dull black lacquer. Refer to this section, paragraph 4.b.(1), for reassembly of this unit.

cA. FRONT PANEL ASSEMBLY OF THE AF TYPE C-5
AND NAVY (STOCK NO. R88-I-1006-20 AND
R88I1006-020-000) INDICATORS.

(1) Wash the "PUSH TO CAGE" knob shaft and gears in cleaning solvent, Federal Specification No. P-S-661a, and inspect them for burrs or other damage.

(2) Inspect the bezel glass gasket to see that it is not stretched or mutilated, and the heater contacts for general damage and security of leads. If replacement of these parts is necessary, follow the disassembly procedure outlined in paragraph 2.c.(1A)(e).

(3) Inspect the black paint on the panel and touch up any scratches with dull black lacquer. Refer to this section, paragraph 4.b.(1A), for reassembly of this unit.



d. DIAL ASSEMBLY.

(1) Clean and inspect the bearings as described in this section, paragraph 3.a.(2).

(2) Wash all parts except the dial, course indicator, and lubber line plate of the Type C-1 or the Navy Directional Gyro Indicators, or the dial and pointer of the Type C-5 Directional Gyro Indicator, in cleaning solvent, Federal Specification No. P-S-661a. Pay particular attention to the bearing recesses and to the machined attaching surfaces. Inspect them for burrs or other defects.

(3) Inspect the black paint and luminescent markings on the dial and on the lubber line plate or pointer. Refer to this section, paragraph 4.b.(2) and 4.b.(2A), for the reassembly of this subassembly.

e. BOTTOM BRACKET ASSEMBLY.

(1) Clean and inspect the ball bearing as described in this section, paragraph 3.a.(2). Place in a dustproof container until ready for reassembly.

(2) Wash all other parts in cleaning solvent, Federal Specification No. P-S-661a, paying particular attention to the recess in the bearing cap.

(3) Inspect all bearing surfaces and machined attaching surfaces for burrs or other defects. These may be dressed down with a fine Arkansas stone and cleaning solvent, Federal Specification No. P-S-661a.

(4) Check to see that the two .005-inch steel shims are not damaged.

NOTE

On later instruments the bottom bracket has been machined to accommodate a thin steel ferrule to be used in place of the shim under the bottom ring. This ferrule also must be free of dents, distortion or other defects. Replace if necessary.

(5) Inspect the bottom ring assembly to see that the spring is riveted securely to the ring and to the caging slide. The rivets need not be tight, but must not be sheared or damaged.

(6) Rub micronized graphite into the sliding surfaces of the top plate, bottom ring, and bottom bracket until the surfaces take on a shiny black appearance. (Refer to this section, paragraph 4.b.(3), for the reassembly of this subassembly.)

NOTE

Be careful not to rub the graphite off during reassembly.

f. TOP BRACKET ASSEMBLY.

(1) Clean and inspect the ball bearings

as described in this section, paragraph 3.a.(2), and place it in a dustproof container.

(2) Wash the top bracket in cleaning solvent, Federal Specification No. P-S-661a, paying particular attention to the bearing recess in the bearing cap. Dry thoroughly.

(3) Check to see that the squirrel cage clamps are held securely and that they lie flat.

(4) If necessary, remove any rust spots from the squirrel cage laminations with 4/0 crocus paper. Wipe a light film of red synthetic alkyd-resin enamel over the squirrel cage laminations, and set the assembly aside until ready for reassembly. (Refer to this section, paragraph 4.b.(3A).)

g. CHASSIS AND BACK PLATE

(1) Dust off the chassis and back plate. Remove any oil or grease spots with cleaning solvent, Federal Specification No. P-S-661a.

(2) Inspect the contact assemblies. Check the insulation for breaks. Check all soldered connections.

(3) Check the wiring for continuity and run a Megger test (500 to 600 volts) between the receptacle shell and each of the prongs. The Megger should register 8 megohms or more. Replace the receptacle or leads as necessary.

(4) Check to see that all attaching screws are tight.

(5) On chassis used with the Type C-1 Turn Indicator and the Navy Directional Gyro Indicators check the position of the caging shaft bushing. The bushing must project from the machined surface 0.162 ± 0.005 inch. (figure 40).

(5A) On chassis used with the Type C-5 Directional Gyro Indicator, check the freedom and general condition of the "CAGED" flag shaft; also check the position of the caging shaft bushing. The bushing must project from the machined surface $.162 \pm .005$ inch (figure 40).

(6) Set the assembly aside until ready for reassembly. (Refer to this section, paragraph 4.c.(1).)

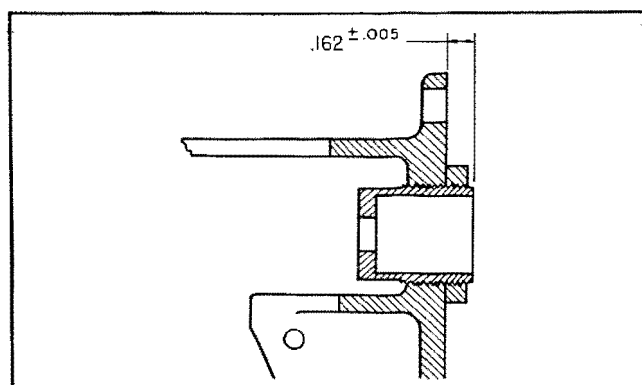


Figure 40

h. VERTICAL GIMBAL AND GYRO ASSEMBLY.

(1) VERTICAL GIMBAL.

(a) Clean and inspect the two ball bearings (gyro axis) as described in this section, paragraph 3.a.(2).

(b) Wash the two bearing caps in cleaning solvent, Federal Specification No. P-S-661a, and blow dry. Inspect the threaded portions of each cap for burrs or other defects.

(c) Wipe the contact surfaces of the flange contacts (pivots) with a clean, soft cloth to remove any oxidation. Check to see that the pivotal point of the center contact is smooth and sharp.

(d) To check the insulation of the flange contact, run a Megger test (500 to 600 volts) between the flange and each contact, and between the two contacts. The Megger should register 8 megohms or more. Replace the assembly if necessary.

(e) Using an Arkansas stone, remove any burrs from the attaching surface and the shoulders of the flange.

NOTE

When replacing a flange contact, check to see that it fits recess snugly and that it enters the inner race of the bearing freely without side-play.

(f) With a cloth and cleaning solvent, Federal Specification No. P-S-661a, remove any oil or grease spots from the vertical gimbal ring.

(g) Inspect the gear, the flange contact recesses, and the threads of the bearing cap recesses for burrs or other defects.

(h) Inspect the ends of the plunger and the two brake shoes to see that they are clean and smooth.

(i) Check to see that all mounting and attaching screws are tight.

(j) Check to see that the tension of the two brake shoe springs is sufficient to hold the brake shoes tightly against the upper surface of the gear.

(k) Inspect all soldered connections and examine all insulation for breaks or shorts. Check the electrical system for continuity and shorting, and run a Megger test (500 to 600 volts) between the frame and each of the leads. (See figures 41 and 41A.) The Megger should register 8 megohms or more.

(l) Inspect the multifinger brushes to see that they are straight. If the torque motor in Type C-1 Indicators must be replaced, and if Stator Assembly, Torque Motor, Part No. 649950, is unavailable, the following substitution may be made.

1. Stator Assembly Motor, Part No. 656934, may be substituted for Stator Assembly, Torque Motor, Part No. 649550, in Type C-1 Indicators.

2. Spacer, Part No. 254905, will be used to center the stator assembly.

(m) With a volt-ohmmeter, check the resistance of the torque motor windings. The resistance between the fixed field leads must be 520 ohms ± 10 percent. The resistance between the control field leads must be 135 ohms ± 10 percent. (See table 1.)

(n) Remove any rust spots from the torque motor laminations with 4/0 crocus paper and apply a very thin coating of red synthetic alkyd-resin enamel to the surface. Set the assembly aside until ready for re-assembly. (Refer to this section, paragraph 4.b.(8).)

(2) GYRO UNIT ASSEMBLY.

TABLE 1 - TOLERANCES

PART	ASSEMBLY	TOLERANCE
Bushing	Cage knob shaft	.162 \pm .005 inch
Field winding	Torque motor	520 ohms ± 10 percent
Control winding	Torque motor	135 ohms ± 10 percent
Stator windings	Gyro rotor	52 to 56 ohms (C-1 and Navy (Stock No. R88-I-1006) Indicators) 113 to 127 ohms (C-5 and Navy (Stock No. R88-I-1006-20 and R88I1006-020-000) Indicators.)
Gyro end-play	Vertical gimbal and gyro	.001 to .002 inch
Vertical gimbal end-play	Turn indicator	.002 to .003 inch
Ball bearings	All	Light finger-press fit

(a) ROTOR.

1. Clean and inspect the ball bearings as described in this section, paragraph 3.a.(2), and place them in dustproof containers until ready for reassembly of the rotor.

2. Wash the rotor body and cap in cleaning solvent, Federal Specifications No. P-S-661a, and blow dry with compressed air.

3. Check the stator windings for continuity and proper resistance value between any contact button and each of the other buttons. (See table 1.) Run a Megger test (500 to 600 volts) between stator shaft and one of the contact buttons. The Megger should register 8 megohms or more.

4. Good electrical contact between the button contacts on the end of the stator shaft and the contact assembly cannot be assured when these units are reassembled. Poor contact at this point could be a cause of rotor failure. To overcome this trouble the stator assembly should be reworked as follows:

(a) Refer to paragraph 2.c.(4)(c) and remove the rotor assembly (Part No. 659695) from the case assembly (Part No. 701801). Also remove stator assembly (Part No. 199355) from the rotor assembly.

(b) Break off the insulator from the insulator and pin assembly (Part No. 199277) which is located at the end of the stator shaft. (figure 40A.) While breaking off this insulator avoid damaging the three contact pins and their insulating tubing.

(c) Push back the insulating tubing which covers the three pins, and mechanically

secure and solder No. 26 AWG plastic covered stranded wire leads each six inches long, to each of the three pins. Maintain the same color code for these leads as exists on the leads from the contact assembly (Part No. 234843). Apply glyptal to the splices with No. 16 insulating tubing, taking care that the pins are not pushed into the shaft. Maintain enough clearance to permit bearing change without rubbing against this splice.

(d) Rework contact assembly (Part No. 234843) as shown by figure 40B. Discount and scrap the old leads that connect this assembly.

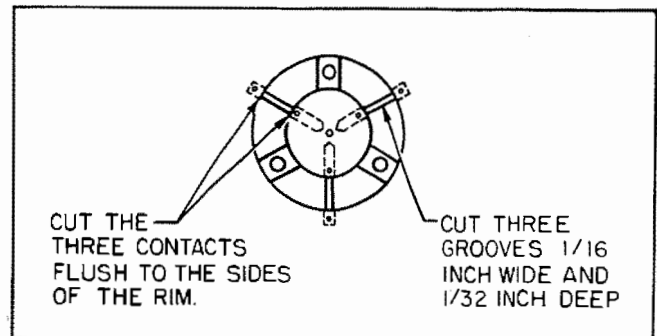


Figure 40B. Method of Reworking Contact Assembly (Part No. 234843)

(e) In reassembling bring the new leads, which were soldered onto the end of the stator shaft, out through the grooves of the reworked contact assembly, and then make the same connections with them as was made with the leads from the contact assembly. Any excess length in these leads should be cut off.

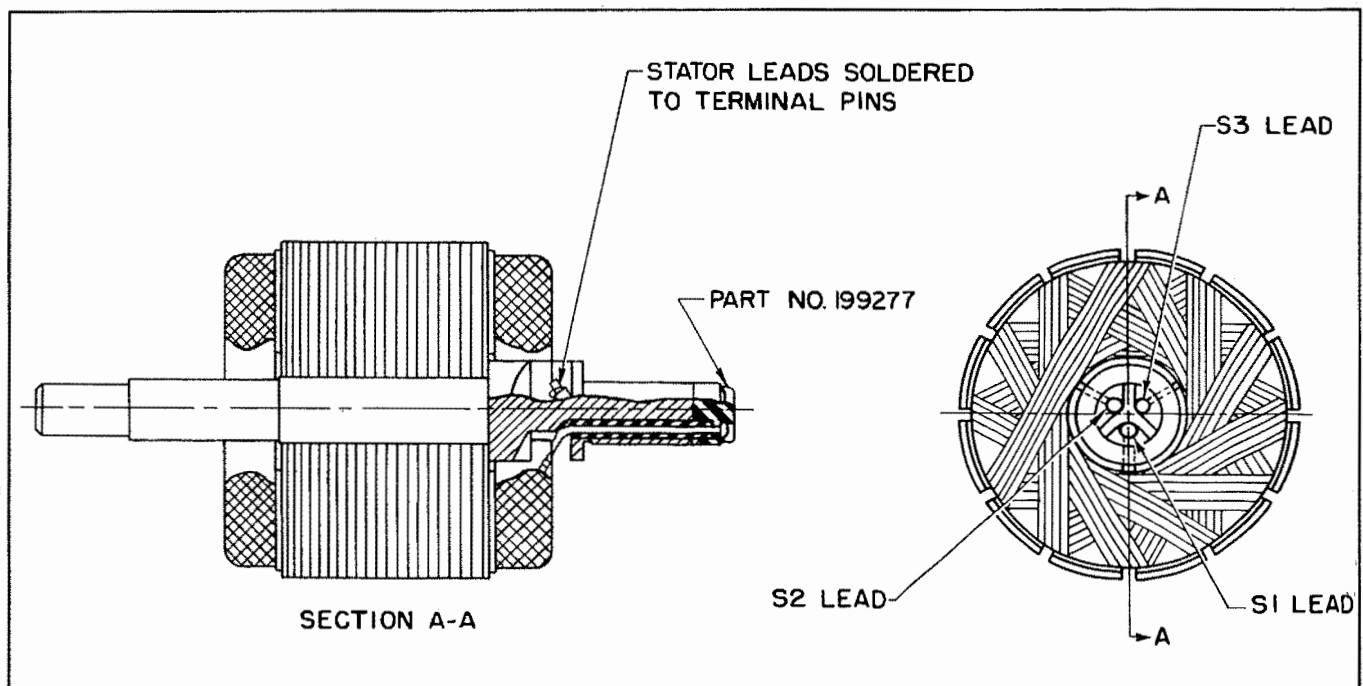


Figure 40A. Stator Assembly (Part No. 199355)

(f) When replacing an old type stator with a new one it is necessary to remove the contact assembly (Part No. 234843) and replace it with the cap assembly (Part No. 835801). In cases where a new cap assembly is not available, the contact assembly

(Part No. 234843) may be reworked as shown in figure 41B by cutting off the three contacts (Part No. 199366) so as to give clearance for the end of the shaft. It will be necessary to cut three grooves on the bottom of the molding for the three stator leads to pass under.

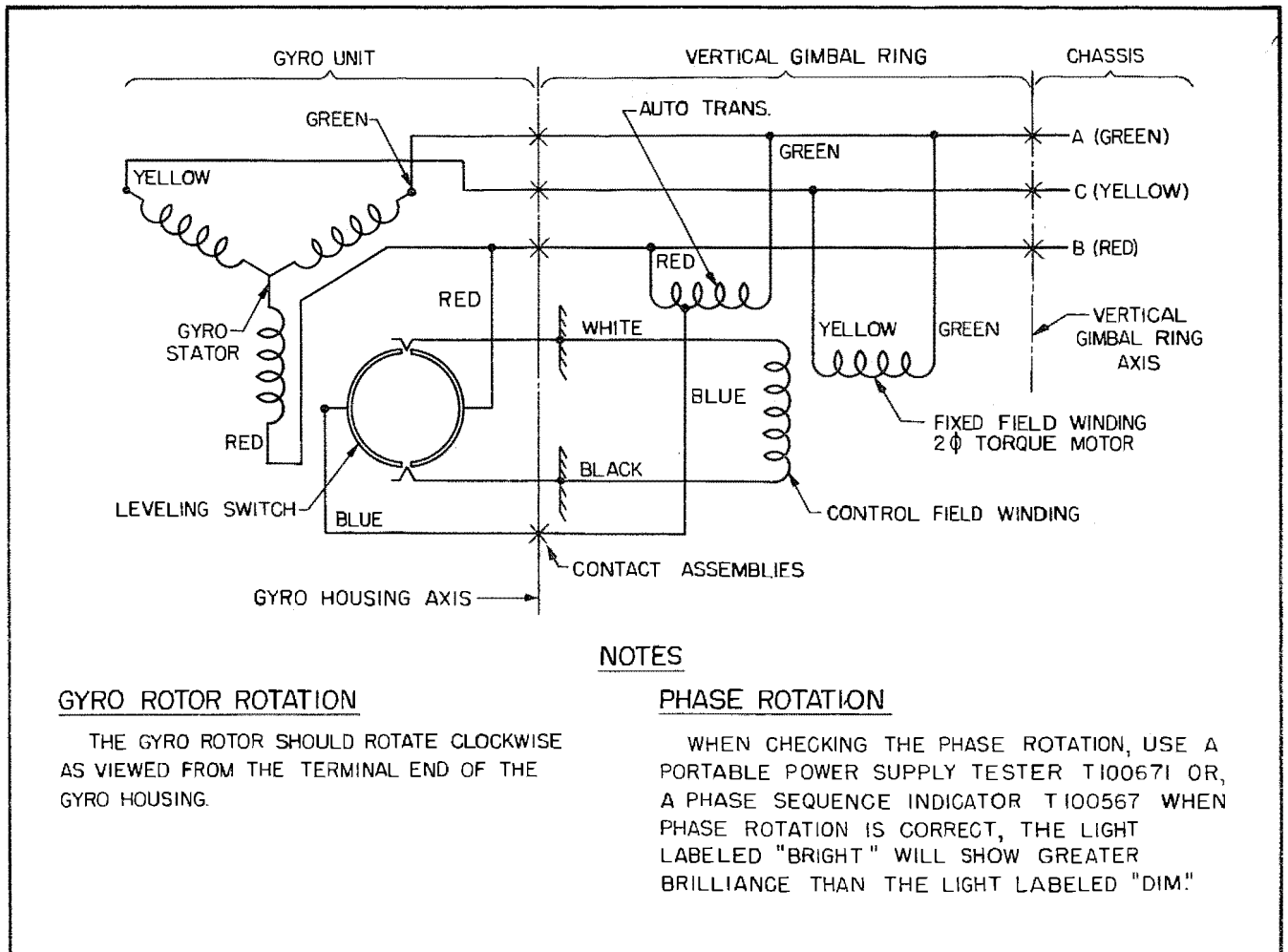


Figure 41

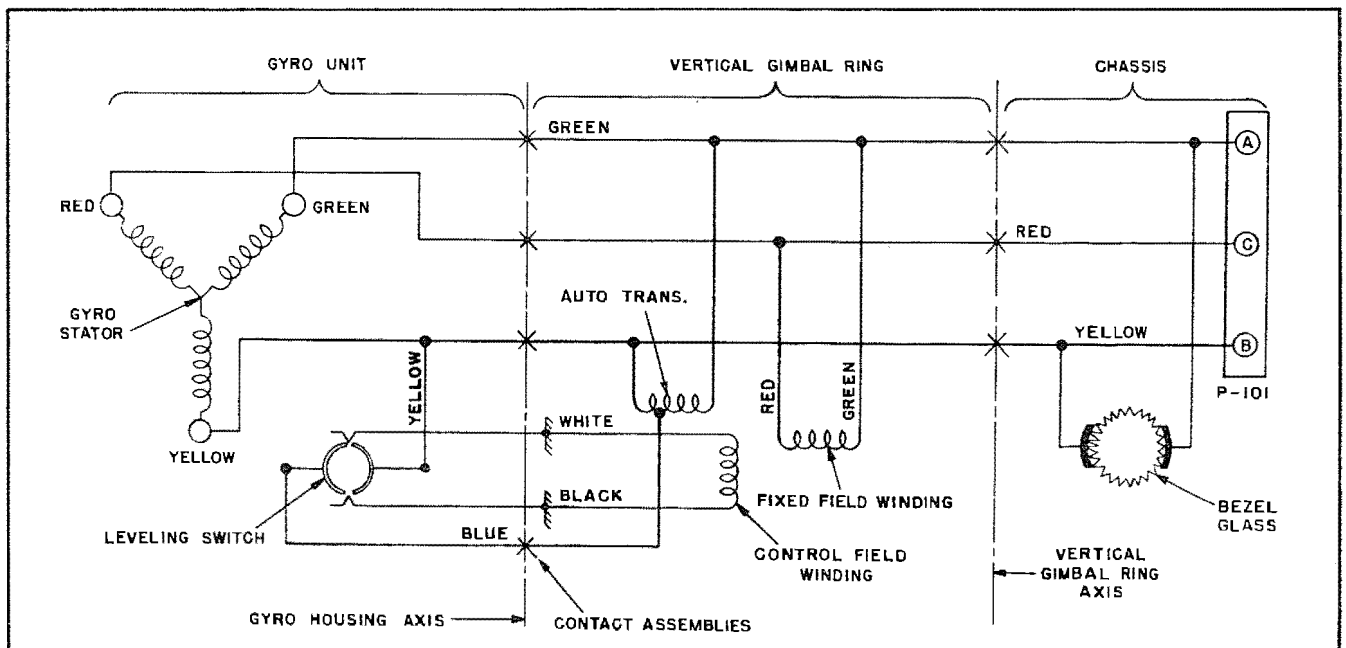


Figure 41A

(b) HOUSING.

1. Wash all parts in cleaning solvent, Federal Specification No. P-S-661, and dry thoroughly. The housing with its oil pad removed is shown in figure 36.

2. Check to see that the balance weight assembly grips its threads firmly.

3. Inspect to see that the detent on the locating washer is intact.

(c) CASE.

1. Wash all parts in cleaning solvent, Federal Specification No. P-S-661, paying particular attention to the flange contact recesses, the stator shaft recess, and the machined attaching surfaces. Dry thoroughly.

2. Inspect the prongs of the triple contact to see that they are flush with the attaching surface of the bakelite.

3. Inspect all insulation, and check all soldered connections. (Refer to this section, paragraph 3.a.(3).)

3A. CLEANING, INSPECTION, TESTING, AND REPAIR
OF THE AF TYPE C-5C DIRECTIONAL
GYROSCOPIC INDICATOR.

a. GENERAL REPAIR OPERATIONS.

(1) The general repair operations given in paragraph 3.a. should be carefully followed when overhauling the AF Type C-5C Directional Gyroscopic Indicator. The instructions cover the luminescent markings, ball bearings (except lubrication, which is covered below), and soldered connections.

(2) For other repair operations covering the five subassemblies making up the AF Type C-5C Directional Gyroscopic Indicator follow the instructions given in subparagraphs b., c., d., e., and f.

(3) To make the leak tests required at various steps in reassembly of the AF Type C-5C Directional Gyroscopic Indicator use a helium mass spectrometer leak detector (Consolidated Engineering Corporation Leak Detector, Model 24-101A or the equivalent). The leak rate at one atmosphere differential pressure should not exceed 0.01 micron cubic feet per hour. If the leak rate is higher, repairs are indicated.

b. COVER ASSEMBLY PARTS.

(1) Scrape off all old sealing compound on the front edges of the cover, and in the flange seats of the pinch-off tube and electrical connector holes. Also remove all the old sealing compound from the electrical connector (J101) if it is to be reused. Make sure the flange edge of the cover is smooth and straight and that the sides are not dented.

(2) Wash the cover in cleaning solvent, Federal Specification No. P-S-661, then dry

thoroughly. Repainting should only be done following final assembly.

c. BEZEL ASSEMBLY PARTS.

(1) Scrape off all old sealing compound on the edges of the bezel.

(2) Remove the excess solder from all soldered parts and re-tin all surfaces to be resoldered. New bellows should be installed when reassembling the bezel assembly and the four old bellows discarded.

(3) Clean all parts of the knob shafts and shaft assemblies in cleaning solvent, Federal Specification No. P-S-661. Carefully inspect all parts for signs of wear and replace worn parts.

(4) Clean the luminescent markings "PONT-ER" and "DIAL AND POINTER" on the knobs.

(5) If the bezel glass has not been removed from the bezel, leak test the seal between the glass and the bezel as instructed in paragraph 3A.a.(3). If repairs are indicated resolder or replace the glass in the bezel as instructed in paragraph 4A.b.(2)(a) and repeat leak test.

(6) Cleaning of the bezel glass, lubrication of parts, and repainting the bezel should be done after soldering and as a part of the reassembly procedure.

d. POWER FAILURE INDICATOR PARTS.

(1) Check the three windings of the assembled power failure indicator for continuity and see that the rotor operates freely and smoothly. Do not apply any lubricant. Clean the luminescent marking "OFF".

(2) If repairs are necessary, disassemble the unit as instructed in paragraph 2A.c.(3) and replace defective parts. Reassemble and recheck for proper operation.

e. GYRO AND GIMBAL ASSEMBLY PARTS.

(1) GIMBAL PARTS.

(a) Clean and inspect the four ball bearings and the ball-bearing adapters. Lubricate the ball bearings with one drop of gyro instrument oil, Specification No. MIL-L-6085A, from a 0.020-inch diameter wire.

(b) Clean the slip rings and contacts with a soft clean cloth to remove any oxidation and inspect for wear. Also clean and inspect the brush contacts.

(c) Check the electrical system for continuity. Examine the insulation of all electrical parts and all wires for breaks or shorts and conduct a Megger test (500 to 600 volts). The Megger should register eight megohms or more. Refer to the wiring diagram, figure 41B.

(d) Clean all adapters and other parts having fine threads with cleaning solvent, Federal Specification No. P-S-661. Look for signs of rust on the fine threads and clean the threads with a fine brass wire brush. Make certain all rust is completely removed.

(e) Clean the damper ring and check that it rotates freely and smoothly.

(f) Inspect all soldered connections and test them to be certain they are secure.

(g) Using a volt-ohmmeter measure the resistance of the torque motor windings. The resistance of the fixed field (as measured between the green and red wires) should be approximately 900 ohms. The resistance of the control field (as measured between the black and white wires) should be approximately 120 ohms.

(2) GYRO UNIT PARTS.

(a) New gyro rotor bearings should be installed when the gyro rotor is reassembled so the old bearings may be discarded.

(b) Inspect the stator and check the winding for continuity. Remove any rust spots from the laminations using crocus cloth.

(c) Inspect the fine threads on the stator shaft to be sure that they have not been damaged. Look for signs of rust on the fine threads and clean the threads with a fine brass wire brush, if necessary. Also remove all excess solder from the terminal on the ends of the shafts.

(d) Inspect the fine threads on the ball-bearing holders and clean, using cleaning solvent, Federal Specification No. P-S-661. A fine brass wire brush may be used to clean the threads.

(e) Clean off all old sealing compound in the V-notch and the terminal cup seats of the shell. Be careful not to damage the fine threads on the shell. Inspect the fine thread to be sure that they have not been damaged.

(f) Scrape off all old sealing compound on the rear surfaces of the two terminal cups. Remove excess solder from the tube type terminals of the two cups and make certain the centers of the terminals are entirely open so as to permit easy insertion of the electrical jumper wires on reassembly of the unit.

(g) Check the slip rings, and all wiring for continuity. Examine the insulation for breaks and shorts, and conduct a Megger

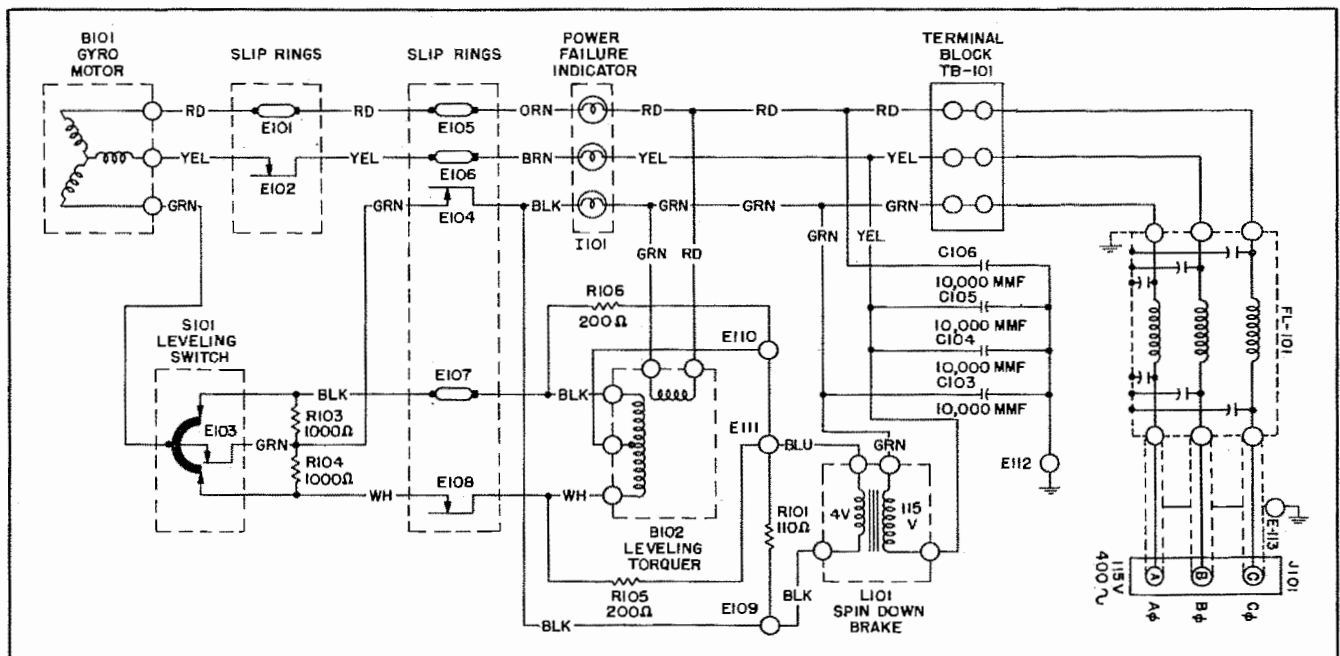


Figure 41B. AF Type C-5C Directional Gyroscopic Indicator, Wiring Diagram.

test (500 to 600 volts) between the shell and each lead. The Megger should register eight megohms or more. Clean the slip rings with a soft clean cloth.

f. FRAME PARTS.

(1) Clean, if necessary, with cleaning solvent, Federal Specification No. P-S-661, the shafts, gears, forks, clutch, and other parts which have been removed from the frame.

(2) Check all wiring for continuity. Examine the insulation for breaks and shorts. Remove excess solder from all solder connections and retin for resoldering.

4. REASSEMBLY.

a. GENERAL.

(1) ASSEMBLY PROCEDURE.

(a) The reassembly of all Indicators consists of reassembling the subassemblies, replacing the subassemblies, and calibration.

(b) After the parts of any subassembly have been cleaned, inspected, tested, and repaired, they should be reassembled immediately in accordance with instructions given in this section, paragraph 4.b., and the resulting subassembly set aside and protected until all the subassemblies are ready to be replaced in the instrument as described in this section, paragraph 4.c.

(c) When the instrument has been completely reassembled and its parts balanced and adjusted properly, it should be calibrated to insure that it will operate properly under flight conditions.

(d) The following general precautions should always be observed when reassembling the Turn Indicator or Directional Gyro Indicator:

1. Keep bearings absolutely clean, handling them with tweezers to prevent fingerprinting.

2. Be careful not to damage machined surfaces.

3. Check to see that all moving parts have sufficient freedom and proper end-play.

4. Be sure that the contacts make good electrical connections without excessive friction.

(2) STATIC BALANCING.

(a) GENERAL.

1. An object mounted on suitable

pivots is referred to as being statically balanced when its weight is so disturbed that the object will remain at rest in whatever position it is placed.

2. Static balance may be achieved by shifting the weight from the heavier side toward the lighter side.

3. When shifting weight, a definite procedure should be followed in order to avoid confusion and repetition of operations. This procedure consists of two basic operations: first, the balancing of the right side against the left, and secondly, the balancing of the top against the bottom.

NOTE

If more convenient, the top may be balanced against the bottom before balancing the left side against the right.

4. For convenience in distinguishing the right side from the left and the top from the bottom, imagine that the object is divided by two perpendicular lines intersecting at the pivot axis. (See figure 42).

5. Mount the object to be balanced on knife-edges. If the object is not statically balanced, it will assume a settling position with the heavy portion down.

(b) EXAMPLE.

1. In the example shown in figure 43, the right side is heavier than the left and the bottom is heavier than the top. According to the principles of balancing, the first step is to balance the left side against the right. To do so, move the weight which governs the balance of the left and right sides toward the left until the line dividing the object into left and right sides is exactly vertical. (See figure 44.)

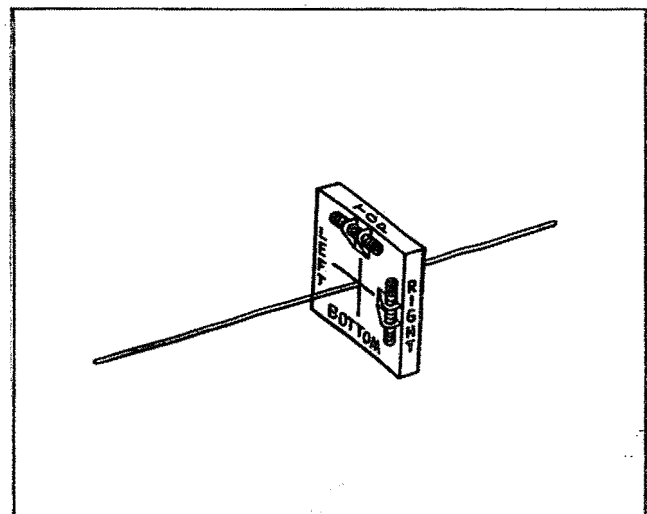


Figure 42

2. The next step is to balance the top against the bottom. This is accomplished by moving the weight, which governs the balance of the top and bottom, toward the top until the line, which divides the object into the top and bottom sections, is exactly vertical. (See figure 45.)

NOTE

If an object will remain at rest when the line separating its top from its bottom is vertical, and when the line separating its left side from its right is vertical, the object will remain in any position it is placed, and is therefore statically balanced.

b. REASSEMBLING THE SUBASSEMBLIES

(1) FRONT PANEL ASSEMBLY OF THE AF TYPE C-1 AND NAVY (STOCK NO. R88-I-1006) INDICATORS.

(a) Clean the inside surface of the glass and remove any lint with a camel's-hair brush. Replace the bezel glass clamp ring, and replace the six Phillips-head screws, tightening them evenly in diametrically opposite pairs.

CAUTION

Do not tighten these screws excessively. If held too tightly, the glass may crack with changes of temperature.

(b) Insert the shaft or shafts in their proper positions, and replace and secure the knobs. Check the shafts for smoothness of operation.

NOTE

On some units there is a .010-inch washer between the panel and the pin on the course setting shaft. This should be placed on the shaft before the shaft is inserted.

(c) Replace the cup, spring, and clutch disc. Set the complete assembly aside until ready for replacing the subassemblies. (Refer to this section, paragraph 4.c.(3).)

(1A) FRONT PANEL ASSEMBLY OF THE AF TYPE C-5 AND NAVY (STOCK NO. R88-I-1006-20 AND R88I1006-020-000 INDICATORS.

(a) Clean the inside surface of the glass and remove any lint with a camel's-hair brush.

(b) Insert the gasket, the heater contacts, the bezel glass, and the bezel glass clamp ring in the front panel, and replace the six flathead screws, tightening them evenly in diametrically opposite pairs.

CAUTION

Tightening these screws excessively may cause the glass to crack when subjected to changes of temperature.

(c) Apply a thin film of AN-G-25 to the gears and shaft, then fasten the planetary gear assembly to the front of the panel with the three fillister head screws. Insert the shaft through the panel and the gear assembly. Slide the sun gear over the end of the shaft, and secure it by inserting the taper pin.

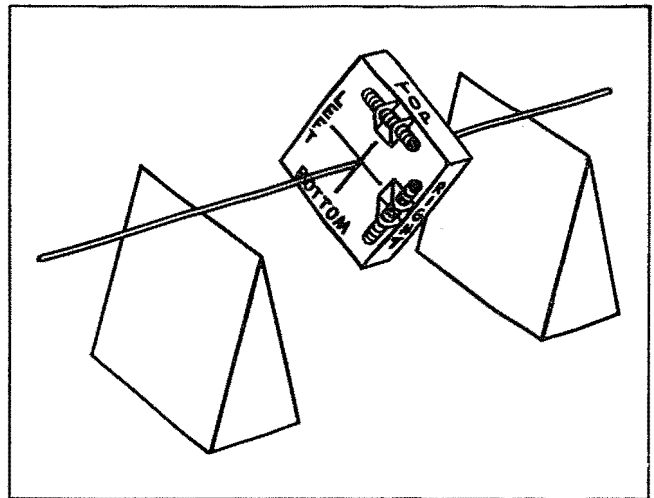


Figure 43

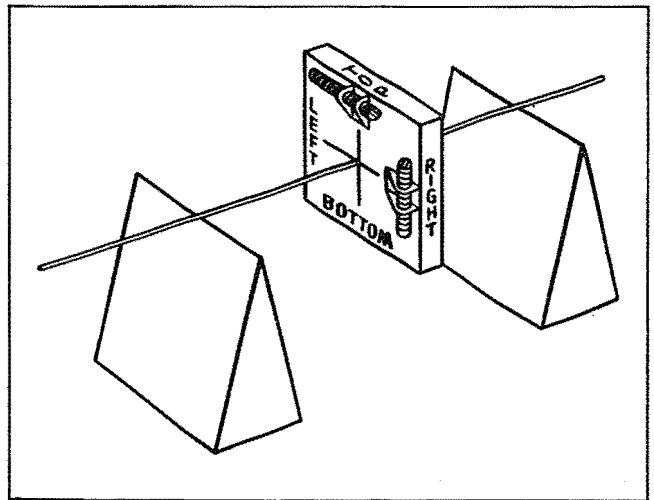


Figure 44

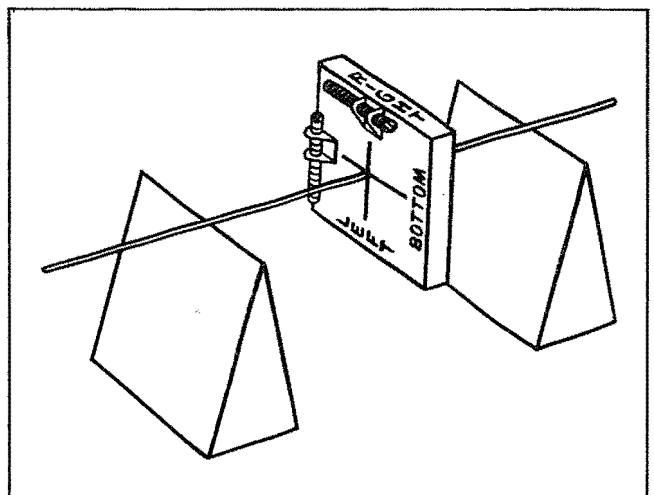


Figure 45

(d) Place the flat washer, knob, and second flat washer on the shaft, and secure them with the snap ring.

(e) Press the knob cover onto the knob.

(2) DIAL ASSEMBLY OF THE AF TYPE C-1
AND THE NAVY DIRECTIONAL GYRO
INDICATORS.

(a) Replace the clean and inspected bearings in their recesses (ball separator sides out), and add one drop of gyro instrument oil, Specification No. AN-O-11, to each.

NOTE

The bearings must fit their recesses with no more than finger pressure; however, there must be no side-play.

(b) Replace the shaft and the dial hub. Align the taper pin holes, and tap the pin in from the proper side. The outside diameter be flush with or below the surface.

(c) Reassemble the gear on the shaft and follow with the spring washer, retainer, and the two flathead screws. The outside diameter of the spring washers must rest against the gear.

NOTE

On later instruments the gear is followed by a flat washer, two spring washers, retainer, and two flathead screws. The outside diameters of these two spring washers face one another.

(d) Replace the dial and lubber line plate and secure the plate with its four fillister-head screws.

(e) When the dial assembly includes a course indicator, place the spring washer over the dial hub so that the outside diameter of the spring washer rests against the dial.

(f) Clean the inside surface of the course indicator and set it in place with the bushing toward the spring.

(g) Replace the retainer and secure it with its two flathead screws.

(i) Hold the dial and rotate the gear. The course indicator must not turn. Hold the course indicator and rotate the gear. The dial must turn.

NOTE

If the assembly will not meet these tests, check to see that the spring washers are in their proper places and are adjusted properly. Replace them, if necessary.

(j) Polish the outer surface of the course indicator and set the assembly aside until ready for replacing the subassemblies. (Refer to this section, paragraph 4.c.(2).)

(2A) DIAL ASSEMBLY OF THE AF TYPE C-5
INDICATOR.

(a) Replace the clean and inspected bearings in their recesses (ball separator sides out), and add one drop of gyro instrument oil, Specification No. AN-O-11, to each.

NOTE

The bearings must fit their recesses with no more than finger pressure; but with no side-play.

(b) Replaces the bevel gear on its hub, and follow with the flat washer, spring washer retainer, and two flathead screws.

(c) Place the spur gear on the front end of the shaft, and fasten its retainer in place with its two flathead machine screws.

(d) Fasten the plate in place with its five fillister head screws.

(e) Place the large spring washer into its recess on the plate.

(f) Reassemble the dial and its hub the two flathead screws which fasten them to the plate.

(g) Attach the pointer and its washer to the retainer with the hexagon head stud. Make sure that there is a minimum clearance of 1/16 inch between the pointer and the mask indices.

(h) Spin the bevel gear and check the large spur gear and pointer for freedom of rotation and absence of a contact with adjacent surfaces.

(i) Check that the dial may rotate while the bevel gear, spur gear, and pointers are held stationary, and that the dial, spur gear, and pointer may be rotated while the bevel gear is held stationary.

(3) BOTTOM BRACKET ASSEMBLY

(a) Replace the large flat shim and the bottom ring assembly on the bottom bracket. Insert the small shim between the caging slide and the bracket and tighten the stud. Check to see that the slide and ring operate freely without binding.

NOTE

On later instruments the large flat shim has been replaced by a ferrule and the caging slide is guided by two studs.

(b) Replace the top plate and three flat springs. Again check to see that the mechanism operates smoothly, and that the springs have sufficient tension to hold the top plate against the bottom ring in any position.

(c) Remove any loose graphite from the assembly with low-pressure air.

(d) Replace the two coil springs and check to see that they have sufficient tension to return the caging slide to the step in the detent plate.

(e) Replace the bearing cap and lock nut.

(f) Set the assembly aside until ready for replacing the subassemblies. (Refer to this section, paragraph 4.c.(1).)

(3A) TOP BRACKET ASSEMBLY.

(a) If the three spacer pins have been removed from the top of the assembly, replace them. Insert the squirrel cage into the bracket, and lock it with three clamps and screws.

(4) ROTOR.

(a) GENERAL.

1. Replace the clean and inspected bearings in their original recesses in the rotor and the bearing cap. If new bearings are being installed, they must enter the recess with a smooth sliding fit without side-play.

1A. When replacing rotor inner races onto the shaft, the fit of the race on the spring end of the shaft must be from .0003 to .0005 inch loose. The fit of the inner race on the other end must be from .0001 to .0003 inch loose. Should the outer races require replacement, the outer diameter should be .0001 to .0003 inch loose on either end of shaft.

NOTE

In assembling a rotor which has greased bearings, insert the grease retainer with the smaller inside diameter into the rotor bearing recess (raised ring first.) Insert the greased bearing, being careful that the lettered side goes in first. Then replace the lipped grease retainer so that the lip encompasses the outside diameter of the bearing. Set the snap ring over this retainer and press it into the groove.

2. Before replacing the spring on the shaft, check the tension it exerts. If this tension measures 7-1/2 lbs nominal when compressed to 19/64 inch, the springs should be replaced with a later type spring which exerts 4-1/2 lbs nominal at 19/64 inch. The Part No. of the new spring is 307969. Place the spring on the grooved end of the stator shaft and follow with the bushing.

NOTE

In later rotor assemblies the bushing is replaced by two tubular washers. These are assembled as follows: Slip the tubular washer over the slotted end of the stator shaft, noting that the flanged end of the washer rests against the shoulder. Next, place the spring on the stator shaft and follow with the smaller diameter of the second washer so that the spring rides on the sleeves of the two washers. On the Type C-5 and Navy (Stock No. R88-I-1006-20 and R88I1006-020-000) Indicators, add an inner race, tapered end outward, to each end of the stator shaft. (See figure 35A.)

3. Insert the slotted end of the stator shaft into the rotor and replace the bearing cap over the other end. Align the two scribed marks and insert the four fillister-head screws and lock washers in their original positions.

Tighten the screws gradually in diametrically opposite pairs until the cap is seated firmly.

4. Spin the rotor by hand to check the bearings for smoothness. If the bearing is oil-lubricated, add a drop of gyro instrument oil, AN-O-11, to each bearing. On later instruments, the rotor bearings are packed with grease at the factory. These instruments are identified by the presence of two red dots located at the junction of the gyro case and housing. All Type C-5 and Navy (Stock No. R88-I-1006-20 and R88I1006-020-000) Indicators are equipped with grease-packed bearings. They should have been lubricated with 75 to 100 milligrams of AN-G-25 grease after cleaning.

5. Check the dynamic balance of the rotor according to instructions given in this section, paragraph 4.b.(4)(b)2.

(b) TESTING.

1. FRICTION TEST (POWER CONSUMPTION)

NOTE

The Navy (Stock No. R88I1006-020-000) Indicator cannot be used in run-in fixture T100663 without an adapter to connect power to the gyro.

a. Set the rotor in run-in fixture T100663 (figure 46) and plug in test fixture T100667. Apply 115-volt, 400-cycle, 3-phase a-c power, and run the rotor for approximately 5 minutes.

NOTE

When the greased bearing rotor is used, run the rotor in for 1 hour.

b. After the initial run-in, check the current in each lead. This should not exceed 150 milliamperes for the Type C-1 and Navy (Stock No. R88-I-1006) Indicators, and 200 milliamperes for the Type C-5 and Navy (Stock No. R88-I-1006-20 and R88I1006-020-000) Indicators.

c. If the current drawn exceeds these values, disassemble the rotor, and clean and lubricate its bearings. (Refer to this section, paragraphs 2.c.(4)(c)2. and 3.h.(2)(a).)

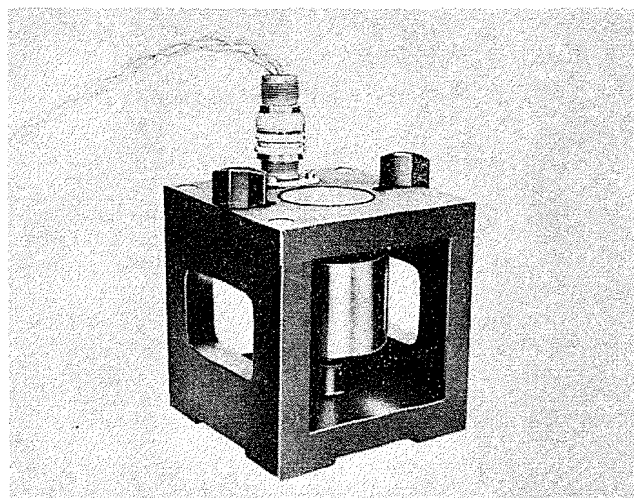


Figure 46

d. If the rotor still draws excessive current, check it for dynamic balance. (Refer to this section, paragraph 4.b(4)(b)2.)

2. DYNAMIC BALANCING.

a. GENERAL.

(1) Dynamic balancing is the balancing of a spinning object as compared with the static balance, that is the balance of an object at rest.

(2) All rotors, to operate smoothly, must be balanced dynamically because the material of which they are composed is never absolutely uniform, some portions being heavier than others. The unbalance of these portions may be offset by balancing each side of the rotor separately. In general, this is done by locating the positions of the unbalance, and then removing enough metal from the flat ends.

b. BALANCING OPERATIONS.

(1) Balance the rotor assembly in the Strobodine Balancing Equipment, T100800, or in the Rotor Balancing Machine T100960.

(2) Whenever a gyro has been disassembled, or when new rotor bearings have been installed, or additional grease added to the bearings, the gyro must be demagnetized, dynamically balanced, and run-in as follows:

(a) Run-in the gyro for between 15 minutes and one-half hour, using a power supply of 30 volts, 60 cycles, three-phase ac.

(b) Balance the gyro dynamically until the unbalance does not exceed 40 micro-inch-ounces.

(c) Run-in for an additional four hours, using a power supply of 115 volts, 400 cycles, three-phase ac.

(d) After the run-in, check the vibration; it must not exceed 300 micro-inches per second, and the current in any one of the leads in the three-phase supply must not be more than 85 milliamperes.

(e) Recheck the balance and correct as necessary.

(5) HOUSING.

(a) Insert a new oil pad in the housing and follow with the oil pad cap. Check to see that the cap is flush with the casting.

NOTE

Before inserting the cap, apply a coat of shellac to its outer diameter. This holds the cap firmly in place and prevents the loss of oil around the joint.

(b) Add between 1/4 and 1/2 cc of rotor bearing oil, AN-0-6a, to the oil pad, distributing it evenly, and set the assembly aside until ready for reassembly.

NOTE

On instruments with red dots located at the junction of the gyro case and housing, the greased bearing has eliminated the need for an oil pad.

(6) CASE.

(a) Replace the contact assembly (triple contact) and insulator, and insert and tighten the three flathead screws.

(b) Replace the contact assembly and insulator, and secure it with its two fillister-head screws.

(c) Check all attaching screws to see that they are tight.

(d) Check the leads for continuity and run a Megger test (500 to 600 volts) between the case and each lead. The Megger should register 8 megohms or more.

(e) Replace the compensator weight, screwing it on all the way. Back off to "0" and tighten the locking screw. Check to see that the weight will rotate between "7" on the "N" side of the weight to "7" on the "S" side of the weight. If the weight binds before it reaches either limit, loosen the screw, back off the weight one full turn, and retighten the screw.

NOTE

No compensator weight is used on Type C-5 instruments.

(f) Insert a new oil pad and the oil pad cap. The cap must be flush with the casting. Before inserting the oil pad cap, apply a coat of shellac to its outer diameter. This holds the cap firmly in place and prevents the loss of oil around the joint.

NOTE

On instruments with red dots located at the junction of the gyro case and housing, and on all Type C-5 instruments, the greased bearing has eliminated the need for an oil pad.

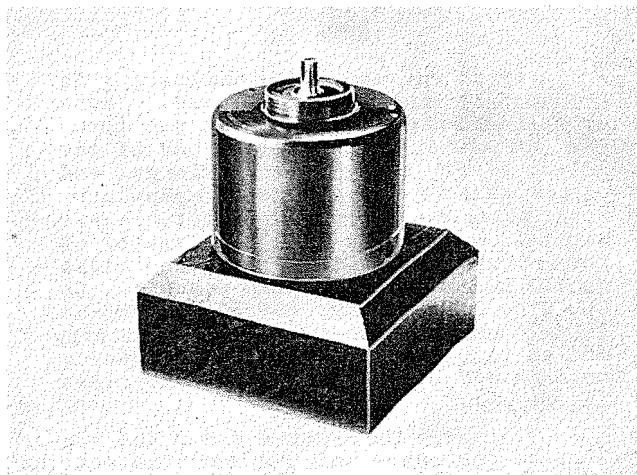


Figure 47

Revised 15 October 1952

(g) On instruments with oil pads, add between 1/4 and 1/2 cc of rotor bearing oil, AN-0-6a, evenly to the oil pad, and set the assembly aside until ready for reassembly.

(7) GYRO UNIT ASSEMBLY.

(a) Before reassembling gyro units of instruments incorporating rotor bearing oil pads, check that the ears on the pads project far enough to contact the inner races of the bearings.

(b) Rest the rotor in holding block T100518 with the slotted end of the stator shaft up. (See figure 47.) Place the housing over the rotor, and turn it until the slot in the stator aligns with the slot in the housing. Drop the key (locating) washer in place, and replace the adjustable lock nut. Insert and tighten the fillister-head screw and lock washer.

(c) Remove the assembly from the holding block. Hold the housing and spin the rotor to check it for freedom. Apply a coating of an approved silicone oil meeting specifications of 40 centistokes, low temperature, and low volatility, to the rotor; this is to prevent corrosion.

(d) Insert the rotor in the case so that the scribed mark on the housing coincides with the mark on the case. Insert and tighten the four fillister-head screws and lock washers.

NOTE

On gyro unit assemblies used in the Navy (Stock No. R8811006-020-000) Indicator, replace the bakelite ring and tighten the three flathead screws (figure 38), tighten the compensator weight (figure 37), and solder the three gyro leads (figure 32A).

(e) Using a volt-ohmmeter, check for continuity between any lead on the case and each of the other leads. The meter must register a resistance value.

NOTE

A break in continuity may be due to insufficient pressure from the contact springs in the triple contact assembly, or improper orientation between housing and case during reassembly. (Refer to paragraph 4.b.(7)(d). This does not apply to the Navy Indicator (Stock No. R8811006-020-000).

(f) To the entire outer gyro assembly apply a coating of an approved silicone oil meeting the same specifications as those for the rotor.

(8) VERTICAL GIMBAL.

(a) Replace the top and bottom flange contacts in the vertical gimbal, and secure them with their three fillister-head screws and lock washers. Check for continuity.



(b) Mount the vertical gimbal in fixture T100588 and adjust the sliding bearing plug until the end-play just disappears.

(c) Replace the two ball bearings in the bearing caps. Lubricate each bearing with one drop of gyro instrument oil, Specification No. AN-0-11.

Note

On later instruments the shoulders in the bearing caps are replaced by spacers. These must be replaced before inserting the bearings.

(9) VERTICAL GIMBAL AND GYRO ASSEMBLY.

(a) REPLACING THE GYRO.

1. With a soft cloth, polish the platinum commutator of the leveling switch.

2. Replace the gyro in the vertical gimbal ring and insert one of the flange contacts in its proper position. Secure the contact with its three screws and lock washers. Check for continuity.

3. Screw the bearing cap in until approximately one of its threads still shows when the lock nut is tightened.

4. Invert the assemblies and replace the other contact flange and bearing cap. Check for continuity.

5. Adjust the position of the bearing caps until the gyro is free on its bearings with approximately .001- to .002-inch end-play when the bearing cap lock nuts are tightened. (See table 1.)

(b) BALANCING THE GYRO.

Note

When balancing the gyro, the unit must be subjected to vibration at a frequency of from 1,500 to 2,000 cycles-per-minute and in such a manner that a point on the unit (in a vertical plane) will describe a circle of not less than .002 nor more than .005 inch in diameter.

1. Set the latitude compensator (on Type C-1 and Navy Indicators) at "0".

2. With the vertical gimbal and gyro assembly in fixture T100588, rest the fixture on end. (See figure 47A.) Centralize the knurled balance weight. Set the gyro horizontal and note the direction in which it departs from the setting. By means of the adjustable lock nut shift the rotor until the gyro will remain approximately horizontal. Secure the lock nut in place with its fillister-head screw, and check to see that the stator shaft screw is tight after making adjustments.

Note

Finer adjustments to the balance may be made by shifting the knurled balance weight. (Refer to this section, paragraph 4.a.(2).) On Type C-5 instruments, however, the balance weight shall not be backed out more than 1-1/2 turns total from the fully screwed-in position.

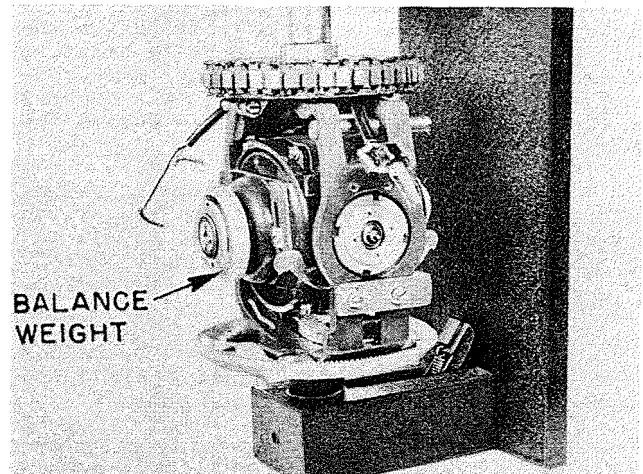


Figure 47A

3. After the gyro has been balanced horizontally, rest the fixture on the bench as shown in figure 47B. Set the gyro vertical and note the direction in which it departs from its setting.

4. Adjust the sliding balance weights (figure 47B) until the gyro will remain exactly vertical.

(c) REPLACING THE CONTACTS.

1. Examine the multifinger (leveling) brushes to see that they are straight. Set them in place on the brush holder and follow with the lugs and fillister-head screws. Check to see that they are centered on the leveling switch segments.

Note

On Type C-5 instruments, check that there is no interference between the brushes and the leveling segment switch leads when the gyro is tilted all the way over against the stops.

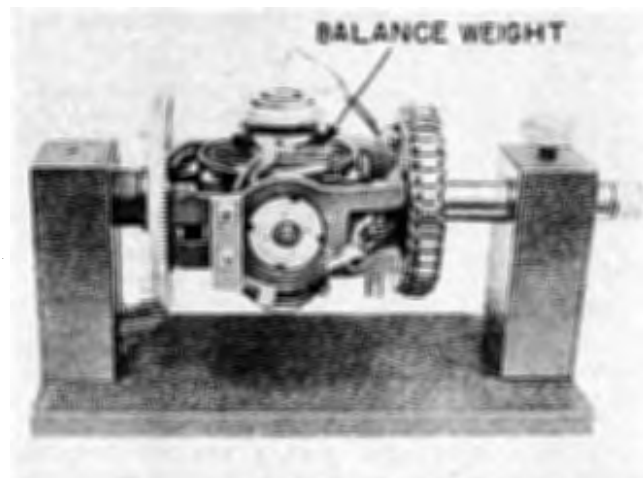


Figure 47B

2. Raise the leaf spring to centralize the gyro, and place a small wedge under the spring to hold it up. Using a volt-ohmmeter, check to see that the brushes do not make contact with either segment. Shift the brushes on the brush holder as required. Remove the wedge when finished.

3. Tilt the gyro, and using a volt-ohmmeter, check the continuity between the switch segments and the brush holder lugs. Adjust the pressure of the brushes by bending as necessary to make good contact with a minimum of friction.

4. Replace the two contact assemblies on either end of the gyro housing axis, and check to see that they make good contact.

5. Check the unit for continuity and run a Megger test (500 to 600 volts) between each lead and the vertical gimbal ring. The Megger should register 8 megohms or more.

6. With a volt-ohmmeter, check for shorts between the red and green leads, the red and yellow leads, and the green and yellow leads. If the meter registers no resistance, the circuit is shorted.

c. REPLACING THE SUBASSEMBLIES.

(1) VERTICAL GIMBAL AND GYRO.

(a) GENERAL.

1. Replace the top bracket assembly on the chassis so that the screw holes for the contact are toward the rear of the instrument. Secure the bracket with its four attaching screws and lock washers.

2. Insert the clean and inspected bearing in the bearing cap of the top bracket. Lubricate the bearing with one drop of gyro instrument oil, Specification No. AN-O-11.

Note

On later instruments the shoulder in the bearing cap is replaced by a spacer. This must be replaced before inserting the bearing.

3. Replace the vertical gimbal and gyro in the chassis and allow it to rest on the top bracket bearing.

4. Insert the clean and inspected bearing in the bearing cap of the bottom bracket. Lubricate the bearing with one drop of gyro instrument oil, Specification No. AN-O-11.

Note

On later instruments the shoulder in the bearing cap is replaced by a spacer. This must be replaced before inserting the bearing.

5. Replace the bottom bracket assembly and secure it with its four attaching screws and lock washers.

6. Temporarily replace the dial assembly and adjust the bottom bracket bearing as required until there is a minimum of backlash between the large gears at the high point. Lock the bearing cap in place.

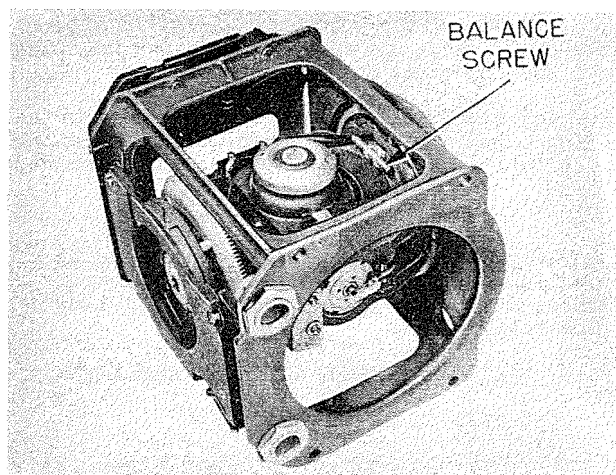


Figure 47C

7. Remove the dial assembly and adjust the position of the top bearing cap until the end-play in the vertical ring is approximately .002 to .003 inch. Secure the bearing cap with its lock nut. Check the freedom of the vertical gimbal ring on its bearings. (See table 1.)

Note

Check to see that the torque motor leads and the contact on the top of the vertical gimbal ring clear the top bracket. Do not replace the top and bottom contacts at this time.

(b) BALANCING.

Note

When balancing the vertical gimbal and gyro, the unit must be subjected to vibration at a frequency of from 1,500 to 2,000 cycles-per-minute and in such a manner that a point on the unit (in a vertical plane) will describe a circle of not less than .002 nor more than .005 inch in diameter.

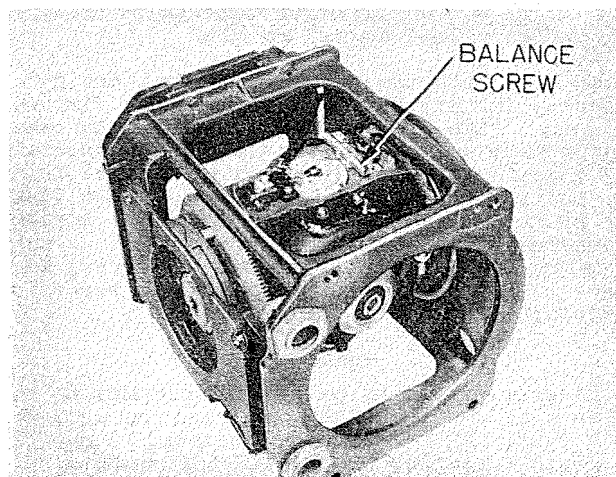


Figure 47D

1. Centralize the two vertical gimbal balance screws in their brackets.

2. With the chassis resting on its side, set the vertical gimbal and gyro assembly horizontal, as shown in figure 47C, and note the direction in which it departs from the horizontal setting.

3. Shift the gyro in the vertical gimbal ring until the vertical gimbal and gyro will remain horizontal as shown in figure 47C. This may be done by screwing out the bearing cap on the light side, and screwing in the bearing cap on the heavy side an equal amount so as not to disturb the end-play in the gyro axis.

CAUTION

Be careful not to damage the contacts when adjusting the bearing caps.

4. Make finer adjustments for horizontal balance by shifting the balance screw. (See figure 47C.)

5. Set the vertical gimbal and gyro vertical (figure 47D), and note the direction in which it departs from the vertical setting.

6. Shift the balance screw (figure 47D) in its bracket until the assembly will remain in the vertical position.

NOTE

For further information on balancing, refer to this section, paragraph 4.a.(2).

7. Replace the top and bottom contacts, making sure that the lead to the bottom contact fits into the channel in the bottom bracket.

8. Check for continuity between each two receptacle prongs. Run a Megger test (500 to 600 volts) between the chassis and each prong. The Megger should register 8 megohms or more.

(2) DIAL ASSEMBLY OF THE AF TYPE C-1 AND THE NAVY INDICATORS.

(a) While holding the flange of the disc clutch between the dial and the course indicator, simultaneously replace the dial assembly on the chassis and enter the disc in its bushing.

(b) Replace and tighten the four dial attaching screws and lock washers. Recheck the freedom of mesh between the gears on the vertical gimbal and on the dial assembly.

(c) Check to see that the flange of the disc clutch is centered between the dial and the course indicator. Adjust the position of the bushing in the chassis as required.

(d) Polish the course indicator and remove any lint with low-pressure air.

(2A) DIAL ASSEMBLY OF THE AF TYPE C-5 INDICATOR.

(a) Assemble the dial assembly to the front of the chassis with the four attaching screws. Recheck the freedom of mesh between the gears on the vertical gimbal and on the dial assembly.

(b) Insert the flag and shaft assembly through the bushing on the lower left front of the chassis, and secure it with a retaining ring applied to the shaft at the back end of the bushing. (Refer to the following note for some Type C-5 Indicators.) Apply a coating of an approved silicone oil meeting the specifications of 40 centistokes, low temperature, and low volatility, to the shaft; this will prevent corrosion. Add the adjustable lever stop and the dural link to the projecting shaft. Align the dural link with the flat stainless steel link of the bottom ring, and join them with a hexagon screw.

NOTE

On some Type C-5 Indicators the caging indicator shaft incorporates a small coil spring and an additional arm which are arranged such that when the instrument is uncaged (flag down) a pressure is exerted on the flag actuating mechanism which tends to keep the flag down. The information contained in the following three steps applies only to these indicators.

(bA) Place the coil spring, the adjustable stop arm, and the other arm, onto the shaft nearest the front of the instrument. With the instrument uncaged (flag down), tighten and secure the arm which supports the linkage to the caging ring.

(bB) Cage the instrument and adjust the position of the front arm until it rests against the chassis. Holding the arm in this position, uncage the instrument and rotate the coil spring in such a way as to apply an approximate 90 degree clockwise pre-load to the spring. Insert the end of the spring into one of the four holes in the bushing provided for this purpose.

(bC) With the front arm still loose on the shaft, adjust it to obtain a 0.010-inch maximum clearance with the chassis; then tighten and secure the arm.

(c) Align the lower edge of the "CAGED" flag with the gear teeth of the dial, then secure the dural link to the flag shaft by tightening the link screw. Depress the caging mechanism until it fully locks the gyro, centralize the adjustable lever stop on the shaft, then set it for a dimension of .005 to .010 inch from the chassis.

(d) Check that the flag throughout its swing does not touch the dial or interfere with the rotation of the pointer.

(3) FRONT PANEL ASSEMBLY.

(a) On Type C-1 instruments, align the grooves in the course setting shaft and clutch disc so that the pin in the disc clutch will engage them.

(b) Replace the front panel assembly and check to see that the course setting knob of the Type C-1 Indicator operates smoothly.

NOTE

On Type C-5 and Navy (Stock No. R88-I-1006-20 and R88I1006-020-000) Indicators, attach the heated-glass leads to their terminals.

(c) Insert and tighten the four front panel attaching screws and lock washers.

(d) Check the operation of the caging mechanism to see that the instrument cages when the caging knob is pressed in, and that it uncages when the knob is withdrawn. On the Type C-5 Indicator, check that the pointer clears the bezel indices by at least $1/16$ inch.

(e) Press the caging knob all the way in and note that approximately one-half of the end of the detent plate contacts the end of the caging slide. (See A, figure 47E.) The detent plate may be bent carefully up or down as required.

(f) On instruments which are equipped with an adjustable caging plunger (figure 47F), the length of the plunger should be adjusted as follows:

1. Press the caging knob ("LOCK AND SET CARD" knob of the Type C-1, and "PUSH TO CAGE" knob of the Type C-5 and the Navy Directional Gyro Indicators) in until the leaf spring just centralizes the gyro. Check to see that gage T100313 fits between the step in the detent plate and end of the caging slide. This space should be $.300 \pm .015$ or $-.000$ inch. (See figure 47G.)

2. To adjust the length of the plunger, first loosen the lock nut, using two $3/16$ -inch end wrenches. Then turn the plunger so that a scriber can be inserted in the hole in its head. Press the caging knob in and place fixture T100313 in position. While holding the plunger with the scriber, turn the screw with the end wrench, until the tension on the gyro is correct. Remove the gage and lock the plunger screw in place.

CAUTION

Upon releasing the caging mechanism, the clearance between the plunger and the top ring must be no less than $.010$ inch. Any contact between the plunger and the top ring will cause the gyro to precess.

d. CALIBRATION. - Calibrate and test the instrument as described in section VII.

e. FINAL ASSEMBLY.

(1) After the unit has passed its tests satisfactorily, secure the cover with its five fillister-head screws and two special screws, lock washers, and flat washers.

CAUTION

Be careful to align the holes in the cover with the screw holes in the casting so that the cover attaching screws do not become cross-threaded and damage the casting.

(2) Thread a new sealing wire through the two special screws and seal it securely.

(3) On those units having an inspection plate on the side of the case, seal the plate with a new decalcomania.

(4) Touch up any bare or scratched places on the cover or panel with dull black lacquer.

(5) Polish the dial glass.



Figure 47F

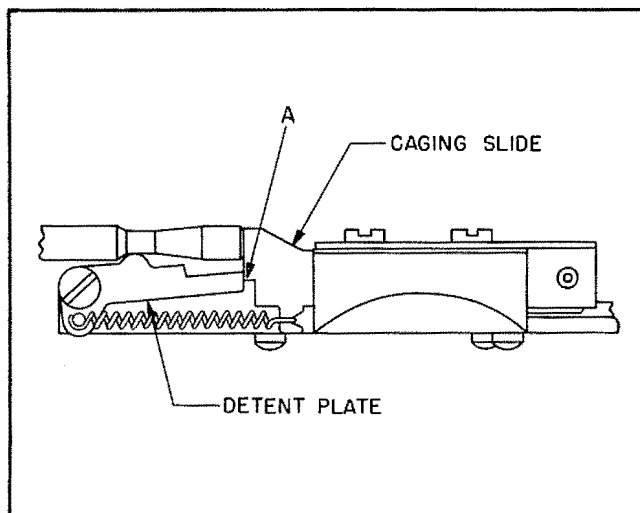


Figure 47E

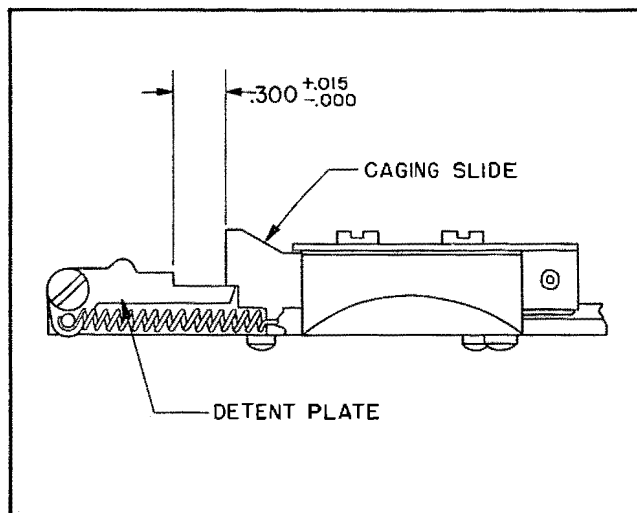


Figure 47G

4A. REASSEMBLY OF THE AF TYPE C-5C DIRECTIONAL GYROSCOPIC INDICATOR.

a. GENERAL.

(1) The reassembly of the AF Type C-5C Directional Gyroscopic Indicator is divided into two main operations; first, the reassembling of the subassemblies; and second, the reassembling of the subassemblies to form a complete instrument. The procedure is given in subparagraph b. and c.

(2) The general assembly procedure given in paragraph 4.a.(1) and the static balancing procedure given in paragraph 4.a.(2) should be carefully followed when reassembling the AF Type C-5C Directional Gyroscopic Indicator.

b. REASSEMBLING THE SUBASSEMBLIES.

(1) REASSEMBLY OF THE COVER ASSEMBLY.

(a) Coat the underside of the flange of a new pinch-off tube with Minnesota Mining Sealing Compound EC-1130. Install the tube in the cover and fasten it in place with the retaining nut, using Pin Wrench 1000346 to install the nut. Do not run the nut all the way down as this will squeeze out the sealing compound.

(b) Coat the underside of the flange of the electrical connector (J101) with Minnesota Mining Sealing Compound EC 1130. Install the connector in the cover and fasten it in place with the retaining nut, using the Adjustable Pin Wrench 1000347 to install the nut. The polarizing key should be at the top. Do not run the nut all the way down as this will squeeze-out the sealing compound. Make sure the three shielded wires (yellow, green, red) are attached to the connector. Resolder the shielded wires to their respective terminals on the filter. (See figure 41B.)

(c) If the filter was removed or changed, and the three shielded wires have not been replaced, solder them to their respective terminals on the bottom of the filter. Position the wires to pass between the filter and the cover, and continue across the top on the inside of the cover to the connector.

(d) Bake the assembled cover in an oven for one hour at a temperature of 180°F (32.22°C) to cure the sealing compound.

(e) Smooth for repainting any chipped or scratched surfaces on the outside of the cover, using only a No. 000 or No. 0000 sandpaper.

CAUTION

Do not use steel wool; minute particles may enter the case, possibly causing shorts and damage to the instrument.

(f) Paint all chipped and scratched surfaces with a dull black lacquer applied with a small brush.

(2) REASSEMBLY OF THE BEZEL ASSEMBLY.

WARNING

During the next operation wear a face shield and asbestos gloves to safeguard against possible injury to the eyes, face, and hands due to spattering solder.

(a) If it is necessary to install a new bezel glass in the bezel, as mentioned in paragraph 2A.c.(2)(g), place the bezel (with its damaged or broken glass) in the Bezel Heating Fixture 1000356 and put the fixture and bezel on a hot plate. Heat until the solder melts. Remove the old glass and solder. Take the bezel and fixture off the hot plate and allow them to cool, then retin the soldering surface of the bezel. The use of Kester Stainless Steel Soldering Flux FSN 3439-250-2629 or equivalent is recommended to tin the bezel assemblies. The following actions will be followed in application of Stainless Steel Solder.

1. Application of stainless steel flux will be restricted to tin bezel assemblies. No working parts or circuitry will be attached to items being treated.

2. Utilization will be confined solely to Sealing Room.

3. Discipline will be maintained to assure maximum protection from corrosive environment.

4. Containers will be conspicuously identified to preclude unauthorized application.

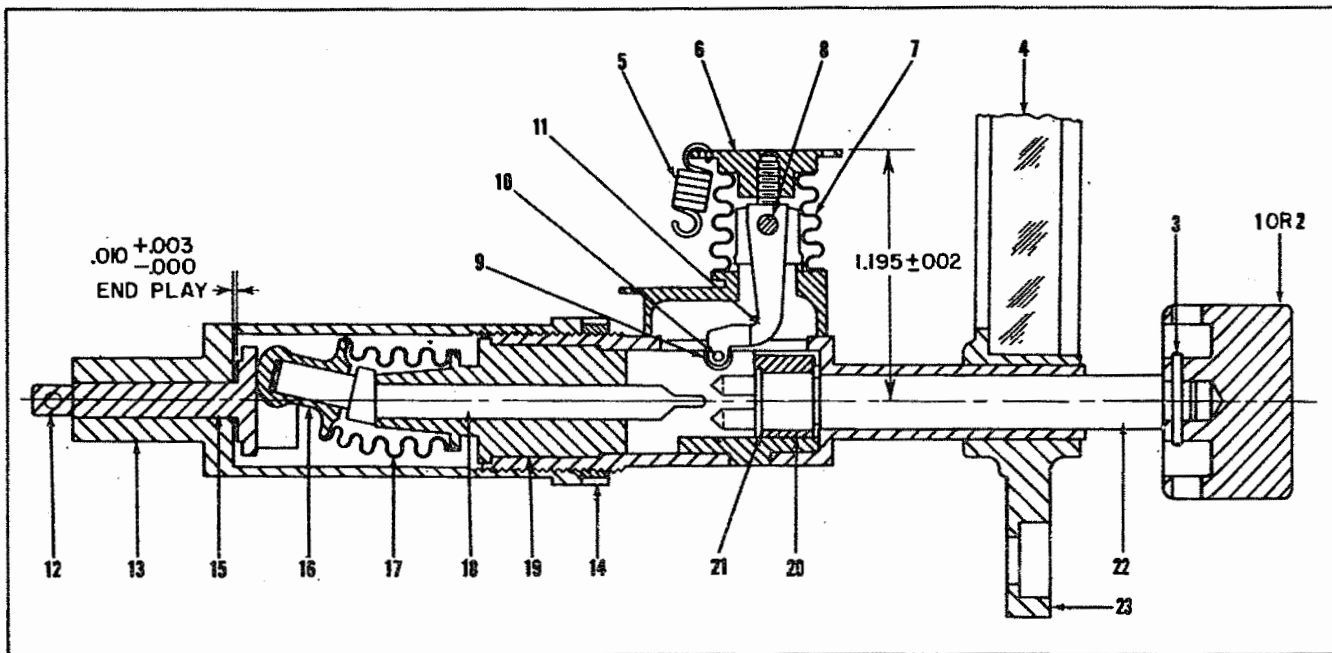
Install a new bezel glass in the bezel and replace the fixture and bezel on the hot plate. Heat up again slowly to the melting temperature of the solder. Solder the new bezel glass in the bezel, using 60-40 solder and Kester Flux No. 1015. Keep the soldered bezel and glass in the fixture and allow it to slowly cool to room temperature. Clean thoroughly with alcohol to remove all flux.

(b) Leak-check the bezel as instructed in paragraph 3A.a.(3). If leaks are found, resolder the bezel glass in the bezel as instructed in subparagraph (a) above, and repeat the leak check. During this test seal the bezel sleeves with the Sleeve Sealing Stopper 1000379.

CAUTION

New bellows must always be installed when reassembling the bezel assembly.

(c) The bezel assembly has two identical shaft assemblies. The assembly procedure which follows is, therefore, given for only one shaft assembly; the second is reassembled



- | | | |
|---------------------------------------|-------------------|---------------------|
| 1 Luminescent knob (POINTER) | 8 Straight pin | 17 Bellows (inside) |
| 2 Luminescent knob (DIAL AND POINTER) | 9 Lever roller | 18 Wobble shaft |
| 3 Roll pin | 10 Straight pin | 19 Shaft bushing |
| 4 Bezel glass | 11 Lever arm | 20 Shaft sleeve |
| 5 Extension spring | 12 Straight pin | 21 Retaining ring |
| 6 Lever head | 13 Outside sleeve | 22 Knob shaft |
| 7 Bellows (outside) | 14 Lock nut | 23 Bezel |
| | 15 Output shaft | |
| | 16 Shaft sleeve | |

Figure 47 H. Shaft Assembly of Bezel Assembly of AF Type C-5C Directional Gyroscopic Unit Cross-Sectional View

by following the same procedure. A cross-sectional view of the shaft assembly is given in figure 47H. The legend for this illustration is the same as that used on the exploded view of the bezel assembly figure 38L.

(d) If removed during disassembly replace the lever arm (11, figure 38L) in the bracket of the bezel tube and pin in place. The lever arm must pivot freely. Set in place the new outside bellows (7) and screw on the lever head (6). Adjust the spacing between the top of the lever head and the center line of the bezel tube to a distance of 1.195 ± 0.002 inches (figure 47H). To measure the spacing use the Setting Fixture 1000357. Solder the bellows in place to both the lever head and the bezel tube, using 60-40 solder and rosin flux. After soldering, clean off all flux and attach the extension spring (5, figure 38L).

(e) Assemble the knob shaft (22) with its shaft sleeve (20), and retaining ring (21). Lubricate all parts with grease MIL-G-3278. Hold the lever arm in a retracted position and drop the knob shaft in place in the bezel tube.

(f) Assemble the shaft sleeve (16), the new inside bellows (17), the wobble shaft (18), and the shaft bushing (19). Lubricate all parts with grease MIL-G-3278. Place the assembled wobble shaft unit in Wobble Shaft Holding and Heating Fixture 1000382, and solder the inner bellows in place, using 60-40 solder and rosin flux. After soldering, clean off all flux with alcohol.

(g) Check the assembled wobble shaft unit for leaks, as directed in paragraph 3A.a(3). If leaks are found, resolder the unit and repeat the leak check.

(h) Apply Minnesota Mining Sealing Compound EC-1130 to the shaft bushing (19) of the assembled wobble shaft unit and press the unit into the bezel tube, using Wobble Shaft Anvil 1000374 and Wobble Shaft Punch 1000375.

(i) Bake the assembled wobble shaft unit and bezel in an oven for one hour at a temperature of 150°F (65.56°C) to cure the sealing compound.

(j) Insert the output shaft (15, figure 47H) in the outside sleeve (13) and lubricate both with MIL-G-3278. Screw the lock nuts (14) in place on the bezel tube, and then screw the outside sleeve on the tube. Adjust the end play of the output shaft so that it will have 0.010 to 0.013 inch of play as measured against the spring pressure of the bellows. When the end play is set correctly, tighten the lock nut (14), using Sleeve Locking Spanner Wrench 1000380 and insert the pin (12) at the end of the output shaft (15).

(k) Check the entire bezel assembly for leaks as instructed in paragraph 3A.a.(3). If leaks are found, disassemble the bezel assembly to the point where the sealing compound can be cleaned off. Apply new sealing compound, reassemble, rebake, and repeat the leak test.

(l) Attach the knob marked "POINTER" to the left shaft and knob marked "DIAL AND POINTER" to the right shaft, and pin the knobs

in place, using Roll Pin Inserting Punch 1000353.

(m) Mask both sides of the bezel glass and paint the front and sides of the bezel assembly with a dull black lacquer. The bezel assembly is now complete.

(3) REASSEMBLY OF THE POWER FAILURE
INDICATOR ASSEMBLY.

(a) Place the insulating washer (8, figure 38M) in position and press the stator (7) onto the base (10) using an arbor press. Insert the shaft of the case (6) and check that the case turns freely. Secure the case in place by pressing onto its shaft the collet with its attached hairspring (4). Position the hairspring so that when viewed from the back it will spiral clockwise, starting from the center.

(b) Insert the outer free end of the hairspring (4) in the hole in the base (10);



bend the end over and insert the wedge (5) to secure the hairspring in the base. Apply General Electric ZV-903 Glyptal to the outside of the wedge.

(c) Rotate the collet on the shaft so that when the hairspring is in its free position the "OFF" flag will be positioned, as shown in figure 38M, about 17-1/2 degrees from the horizontal.

(d) Replace the bracket and fasten it in place with the two fillister-head screws and lock washers.

(e) Check the operation of the unit to be sure the case turns smoothly and freely.

(4) REASSEMBLY OF THE GYRO ROTOR ASSEMBLY.

NOTE

New ball bearings should always be installed when reassembling the gyro rotor and the gyro unit. Care must be taken that the ball bearing and its matched flanged inner race are always used together. (Each race of the bearing is serialized with the same number to identify them). If the ball bearings are received packed in a preservative grease this grease must be completely removed and the ball bearing relubricated with 15 milligrams of AN-G-25 grease. If the ball bearings are received prelubricated they can be used without changing the lubrication. Always make certain that the flange surfaces are thoroughly clean.

(a) Place the gyro ring (19, figure 38U) of the gyro rotor assembly on the Bearing Aligning Anvil 1000386 with the surface of the ring marked "X" facing up. Heat the gyro ring and anvil in an oven to 300°F (148.89°C).

CAUTION

Do not exceed 300°F (148.89°C); to do so will damage the ball bearing races when they are later installed in the gyro ring.

(b) Stack the two new inner ball-bearing races (15), the squirrel cage (18), and the stator (17) and clamp the four parts together, using Arbor Press Adapters 1000369, 1000370, and 1000371. Chill the clamped together parts to 10°F (-12.22°C).

(c) When the gyro ring and anvil have attained a stabilized temperature of 300°F (148.89°C) and the four clamped-together parts have attained a stabilized temperature of 10°F (-12.22°C) simultaneously place both on the Arbor Press Adapter 1000359 and quickly and in one motion assemble the two.

(d) Install new ball bearings (15) in both bearing holders (13) and fasten in place with the bearing locks (16). If a new stator is to be installed, select parts so that the bearing holders will thread on the stator shaft.

(e) After the above assembly parts have cooled and reached a stabilized room temperature, screw the two bearing holders

onto the shaft of the stator (17), but do not make contact with the inner races. Check the serial numbers to make sure the ball bearings match the inner races. Replace the two lock nuts (14) one on each end of the shaft. A cross sectional view of the assembled gyro rotor in the shells is shown in figure 47J. The legend is the same as that of figure 38U.

(f) The stator must be centralized (balanced) in the gyro rotor and the rotor bearings preloaded. This is done in the following manner.

1. One face of the gyro ring is square for assembly purposes. The opposite face is marked with an "X" to distinguish the two faces. The end of the gyro rotor corresponding to the side marked with an "X" shall be called the "B" end and the other side shall be known as the "A" end for reference purposes.

2. Orient End Play Fixture 1000384 as shown in figure 47H-1. Place the gyro rotor (12) in the fixture as shown with the "A" end down. Be sure the face of the rotor seats squarely on the adapter (11). Lock in place securely by screwing the clamp ring (13) down tightly.

3. Place the weight assembly (6) as shown, engaging the two pins in the holes of the bearing holder. Lock in place with lock nut (15), using wrench (3).

4. Engage detent pin (14) in one of the four notches in the weight assembly (6).

5. Remove the lock nut (14, figure 38U) on the "B" end of the stator shaft and thread the anvil (7, figure 47H-1, shown dotted) onto the stator shaft.

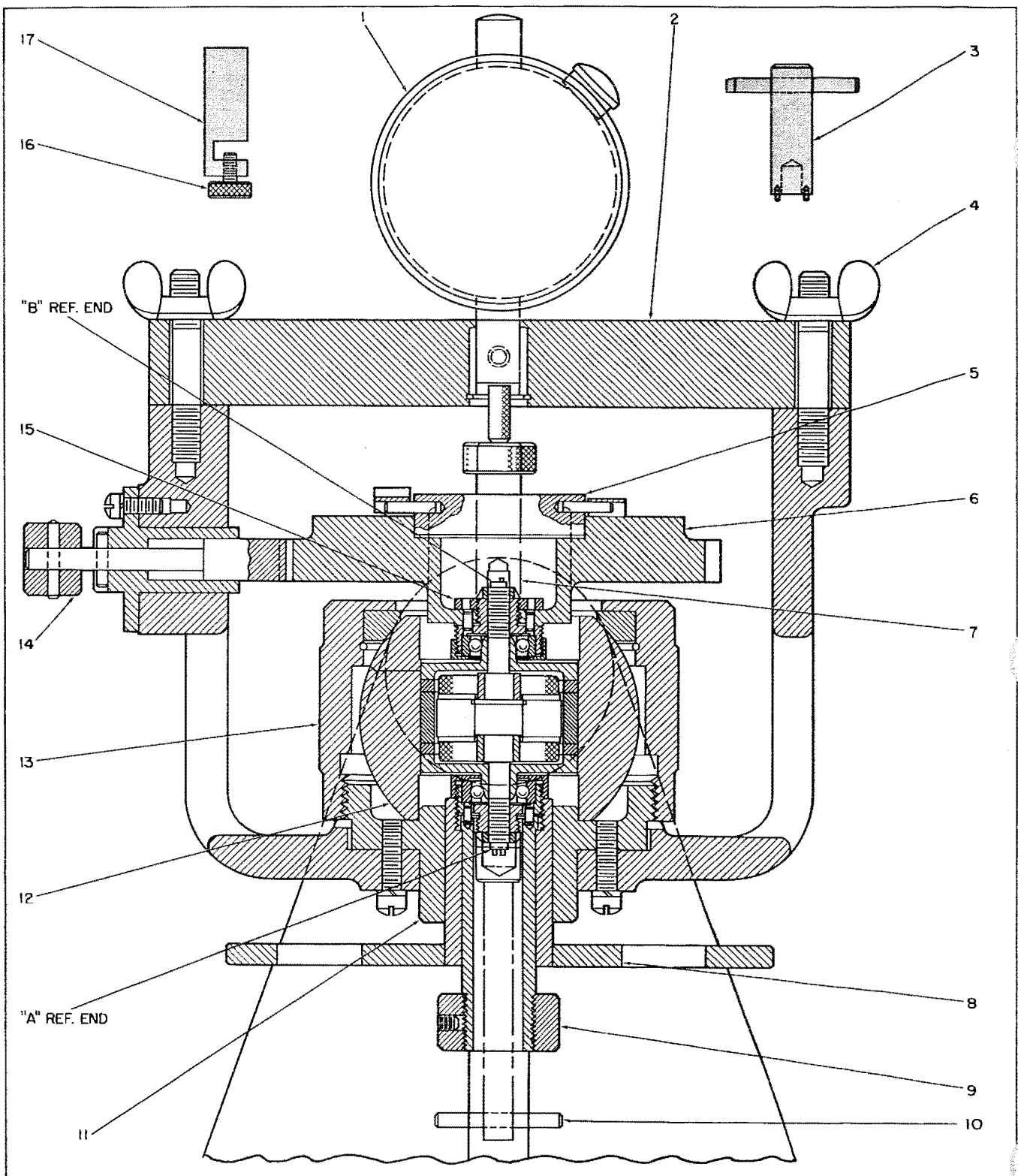
6. Turn the carriage of the fixture one-half revolution ("B" end down). Place the wrench assembly (8) as shown, engaging the pins in the holes of the bearing holder and threading the outside sleeve onto the threads of the bearing holder. Hold the knurled handle (9) of the wrench stationary and lock the wrench assembly by turning the outer ring.

7. Temporarily tighten the lock nut on the "A" end, using Lock Nut Spanner Wrench 1000383.

8. Now turn the carriage one-half revolution ("A" end down). Place the Indicator adapter (2) on top of the carriage and lock securely in place with the two wing nuts (4).

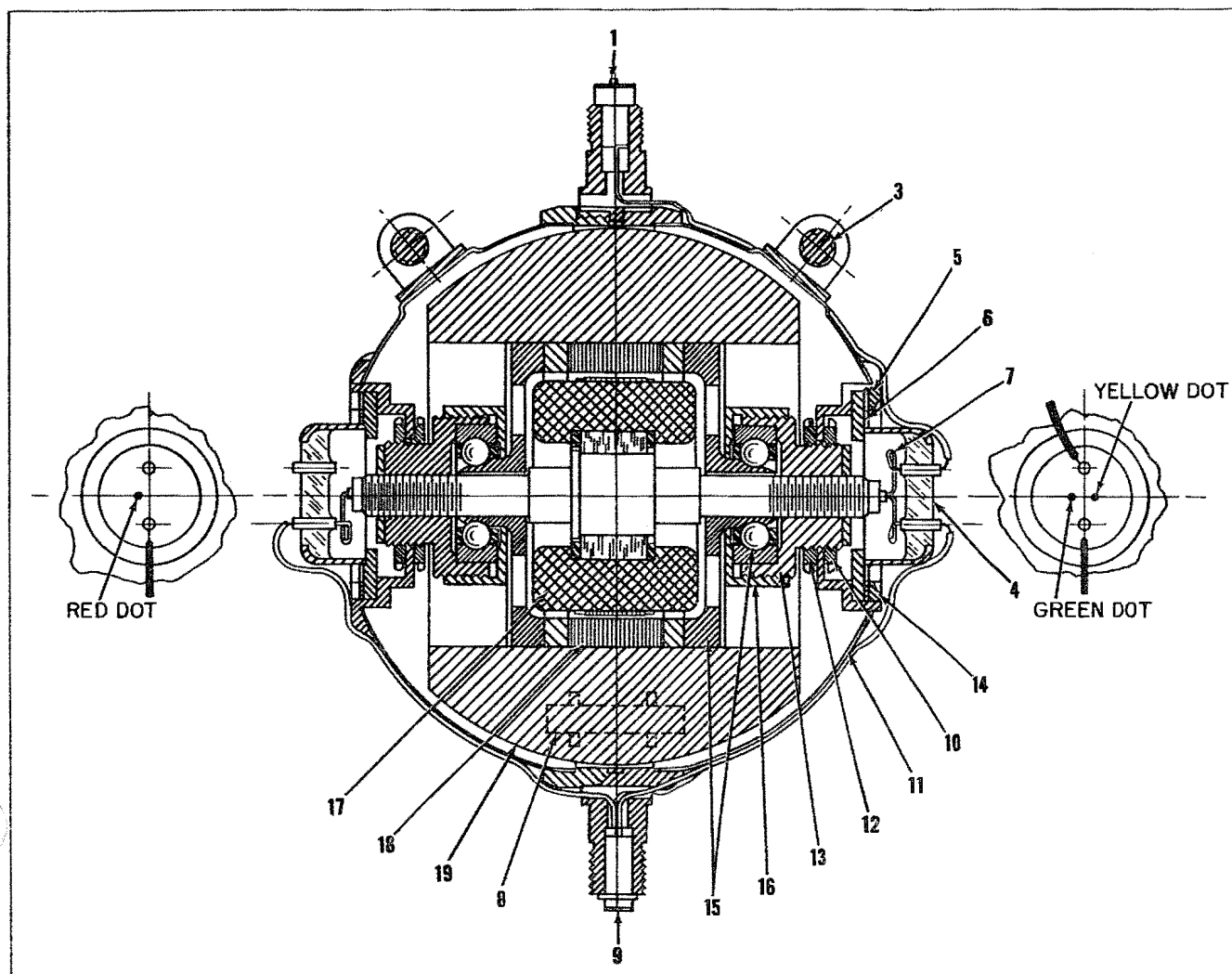
9. Mount the 0.001 dial indicator (1) as shown. Push the body of the indicator down until the plunger makes contact with the anvil, and lock in the desired position.

10. Lift up on the wrench assembly (8). The Indicator should show a movement of approximately 0.050 inch. This movement should be the play of the stator inside the rotor and should not be restricted by the bearings. If the bearing or the "B" end is restricting the movement, the anvil should be loosened a few turns, and the wrench assembly (10) turned clockwise (viewed from above) until the maximum deflection is obtained. Lock the "B" end by



- | | | | |
|---------------------|-------------------|-------------------|---------------|
| 1 Dial Indicator | 5 Anvil | 9 Knurled handle | 13 Clamp ring |
| 2 Indicator adaptor | 6 Weight assembly | 10 Wrench 1000383 | 14 Detent pin |
| 3 Wrench | 7 Anvil | 11 Adapter | 15 Lock nut |
| 4 Wing nuts | 8 Wrench assembly | 12 Gyro Rotor | 16 Screw |
| | 17 Pointer | | |

Figure 47H-1. End Play Fixture 1000384.



- | | | | |
|----|---------------------------------|----|-----------------------------|
| 1 | Leveling switch (S101) | 11 | Shell and bracket |
| 2 | Pinch-off tube (See figure 38U) | 12 | Gear lock nuts (inner) |
| 3 | Fillister-head balancing screw | 13 | Bearing holder |
| 4 | Terminal cup | 14 | Lock nut |
| 5 | Retainer ring | 15 | Ball bearing and inner race |
| 6 | Cup gasket | 16 | Bearing lock |
| 7 | Electrical jumper wires | 17 | Shaft and stator |
| 8 | Balanced weight screw | 18 | Rotor (squirrel cage) |
| 9 | Slip rings | 19 | Gyro ring |
| 10 | Gear lock nuts (outer) | | |

Figure 47J. Gyro Unit of AF Type C-5C Directional Gyroscopic Indicator, Cross-Sectional View

tightening the anvil (7). If the bearing on the "A" end is restricting the movement, loosen the locknut on the "A" end and turn the wrench assembly (8) clockwise (viewed from above) until the indicator stops or until the maximum deflection is obtained when lifting the wrench assembly. Tighten the lock nut on the "A" end. Record the reading.

11. To centralize the stator in the rotor, one-half of the clearance measured in step 10, should be left on either side of the stator for clearance between the shoulder on the stator shaft and the inside of the bearing flange. Loosen the anvil (7) a fraction of a

turn. Zero the dial indicator. Invert the carriage ("B" end down). The indicator should read the same as the deflection measured in step 10. Turn the wrench assembly (8) clockwise (viewed from above) until the indicator reads one-half of the movement measured above ± 0.001 inch. Right the carriage by turning it one-half revolution ("A" end down). Do not allow the wrench to turn. Clamp the pointer (17) onto the ring of the wrench assembly (8), using screw (16) so that it lines up with the zero mark on the carriage. This is done to be sure that the wrench does not turn during the next operations. Remove the dial indicator (1), the indicator adapter (2), and the anvil (7). Replace the lock nut and tighten it

securely. This completes the adjustment on the "B" end. Note that the pointer lines up with the zero mark when the operation is complete. The pointer can now be removed.

12. Place anvil assembly (5) as shown and turn it counterclockwise to lock it in place. Replace the indicator on the fixture. Invert the fixture and zero the dial indicator. Right the fixture ("A" end down). The reading should be the same as in step 11. Loosen the lock nut on the "A" end of the stator shaft and turn the wrench assembly counterclockwise (viewed from above) until the play has been reduced to $0.005 \pm .001$ inch. Replace the 0.001 dial indicator with the 0.0001 indicator.

13. Invert the fixture, "B" end down, and zero the indicator. Right the fixture ("A" end down). The indicator should read approximately 0.005 inch. Turn the wrench assembly counterclockwise, (viewed from above) until the play has been reduced to 0.0020 ± 0.00005 inch. Lock the jam nut on the "A" end. Invert the fixture. Unlock the detent pin (14) and spin the weight assembly. Zero the indicator at the average reading. Reverse the fixture and again spin the weight assembly. The average reading should be 0.0020 ± 0.00005 inch. If the difference between the two readings does not fall within 0.0020 ± 0.00005 inch, loosen the jam nut on the "A" end and make the necessary adjustment.

14. Lock the weight assembly with the detent pin. Clamp the pointer (17) onto the ring of the wrench assembly, using screw (16) so that it lines up with the zero mark on the carriage of the fixture. Loosen the lock nut on the "A" end and turn the wrench 63 degrees counterclockwise (viewed from above). Tighten the lock nut on the "A" end.

15. Zero the dial indicator and note the change in reading when the fixture is inverted. This reading should be between 0.0002 and 0.0003 inch. If the reading falls outside these limits, do not attempt to make an adjustment. Turn the wrench 63 degrees clockwise (viewed from above) and reset the 0.0020 ± 0.00005 -inch end play. Repeat the procedure in step 14.

16. Dynamically balance the assembled rotor in a rotor dynamic balancing machine, using Balancing Machine Adaptor 1000387 at 8400 ± 300 revolutions per minute.

CAUTION

The gyro rotor when operated electrically must be started and run in a controlled atmosphere. Refer to paragraph 2A.c.(4) (d).

17. The rotor must be run-in for 150 hours as follows: Place the rotor in Rotor Run-in Fixture 1000360 as given in figure 38S. Be sure to follow the color coding. The gyro rotor must be started in an atmosphere of dry air, nitrogen, or a mixture of the two, at a pressure of 5 to 10 inches of mercury, absolute (20 to 25 inches mercury vacuum). Once the

rotor has reached a speed of approximately 380 revolutions per second the pressure may be reduced to a full vacuum. The speed should be 383 revolutions per second (minimum) as measured using a Strobocorr (C.G. Conn Ltd., Elkhart, Indiana) or equivalent. The power consumption should not exceed 3.7 watts with 80.5 ± 2 volt, 3-phase, 400-cycle power supplied.

18. After the run-in operation has been completed, mount the rotor in the End Play Fixture 1000384, figure 47 H-1, place the calibration weight assembly (6) and wrench assembly (8) in position, and mount a 0.0001 dial indicator (1). Check the end play to determine that it is between 0.0002 and 0.0003 inch as the fixture is rotated.

NOTE

If the speed and power is not within tolerance, or if the end play exceeds 0.0003 inch, remove the 63-degree end loading and repeat the procedure given in steps 13., 14., and 15. Recheck speed and power.

(5) REASSEMBLY OF THE GYRO UNIT ASSEMBLY.

NOTE

The leveling switch (1, figure 38U) and the slip rings (9) are normally not disassembled from the shell (11). If either are damaged and must be replaced, press out and install new parts, applying a coat of bakelite cement (Sperry Adhesive No. 3) to the part before inserting it in the trunnion. Use the Slip Ring Holder Clamp 1000358 to hold the leveling switch or slip rings in place while the cement is setting. When inserting the leveling switch (1) it should be positioned so that the contacting segment of the switch is parallel to the spin axis of the gyro. To make this setting use Switch Setting Leveling Fixture 1000364.

(a) Screw the two inner gear lock nuts (12, figure 38U) on the bearing adapter, and insert the gyro rotor in the shells (11). Handle carefully so as not to damage the fine threads on the shells and gyro unit. Screw the two half shells together, hand tight, then back off approximately two turns. Fill the V-notch of the shell with Minnesota Mining Sealing Compound EC-1130, using a hypo syringe. Tighten the shells until the scribed line of each half are in alignment. Thread on the two outer gear lock nuts to keep the rotor from being damaged. Place the assembly in an oven and bake for 30 minutes at 180°F (82.22°C) to cure the sealing compound.

(b) The assembled gyro rotor unit must next be centralized (balanced) in the shells. To do so mount the gyro unit in the Static Balancing Fixture 1000363. Remove the two outer gear lock nuts (10) if previously assembled for handling purposes. Turn the gyro unit until the spin axis is in a horizontal position. Balance the gyro by positioning the rotor in the shell assembly. This is done by

threading the inner gear lock nuts (12) "in" on the "heavy side" and the inner gear lock nuts (12) "out" an equal amount from the center on the "light side". The gear lock nuts are turned by a scriber inserted through any one of the four holes in the hubs of the shell.

CAUTION

Use great care in the next operation when adjusting the gear lock nuts so as not to distort the shells or damage the shaft.

(c) After the gyro unit is balanced, lock one side with an outer gear lock nut (10, figure 47J), using Wrench 1000546. To prevent damaging the case of gyro when locking the other outer lock nut use End Play Fixture 1000362 as follows:

1. Thread the bushing into the shell on the side already locked.

2. Place the gyro unit on the end play fixture, slipping the bushing into the socket as shown in figure 47J-1.

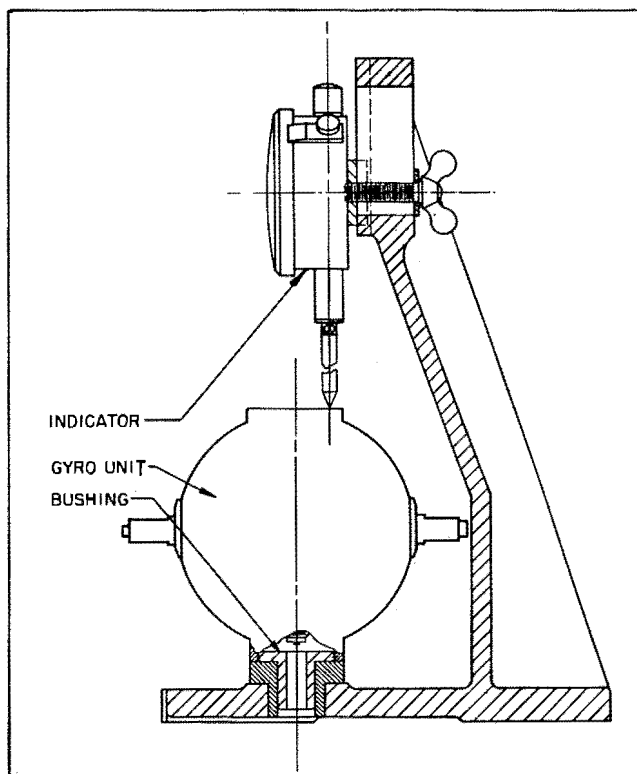


Figure 47J-1. End Play Fixture 1000362

3. Set the dial indicator to zero.

4. Using a metal pick, turn inner gear lock nut (12 figure 47J) on the upper end counterclockwise until the dial indicator shows a 0.0001 to 0.0003-inch distortion.

5. Thread on the outer lock nut and tighten securely. The indicator should return approximately to its original position.

6. Apply several small dots of Glyptal to the gear lock nuts exposed through the four holes in the hubs of the shell. Keep the Glyptal below the root diameter of the gears.

(d) Solder the three electrical jumper wires (7) to the terminals on the ends of the gyro rotor shaft (two terminals on one end; one terminal on the other). Temporarily place the terminal cups (4) in place and check that the electrical jumper wires (7) fit in their proper holes in the terminal cups; also check to be sure the color coding is correct (yellow to yellow, green to green, red to red). Remove the terminal cups, coat their rear surfaces with Minnesota Mining Sealing Compound EC-1130, and replace them in position, with the three electrical jumper wires (7) in their correct places. Install the cup gasket (6) and retainer ring, using Retaining Nut Spanner Wrench 1000361.

(e) Coat the threads of a new pinch-off tube (2) with Minnesota Mining Sealing Compound EC-1130 and screw the pinch-off tube in the shell. The gyro unit is now completely assembled and all parts should be in place as shown in cross-section view, figure 47J.

(f) Bake the assembled gyro in an oven for one hour at a temperature of 180°F (82.22°C) to cure the sealing compound.

(g) Solder the three wires on the shell to the contacts on the terminal cups. Make sure the color coding is followed (the button contact is yellow; the slip ring connection is red). Solder the connection on the terminal cup having no wire attached to it so that the gyro unit will be hermetically sealed.

(h) Check the assembled gyro unit for leaks as instructed in paragraph 3A.(3). If leaks are found, disassemble the gyro unit to the point where the faulty seal can be reached. Clean off all sealing compound. Apply new sealing compound reassemble, and bake again. Recheck for leaks.

(i) Attach a vacuum pump to the pinch-off tube and exhaust at a pressure of 50 microns of mercury absolute for three hours, heating the gyro unit continuously during the entire time at a temperature of 200°F (93.33°C). Discontinue the heating and keep on exhausting the gyro unit until its temperature has returned to a stabilized room temperature.

(j) Fill the gyro to atmospheric pressure with helium at room temperature. Evacuate to 1/4 inch of mercury or less and fill to pressure of 10-1 1/2 inches of mercury absolute with helium meeting the following specification: 98% purity, free from dust particles, 0.006 milligrams maximum water vapor per liter (dew point: 65°C).

(k) Seal the pinch-off tube at a height not to exceed 3/8 inch, using Tube Pinch-off Pliers 1000355. Solder the pinch-off tube with 60-40 solder and rosin flux. After soldering clean off all flux and coat with General Electric Glyptal 1201. The gyro unit is now assembled, hermetically sealed, and ready for testing and installation in the gimbal.

(l) Test the gyro for speed and power consumption using Gyro Running Test Fixture 1000408. Refer to paragraph 2Ac(4)(b).

(m) (Deleted).

(n) (Deleted).

(6) REASSEMBLY OF THE GYRO UNIT AND
GIMBAL ASSEMBLY.

CAUTION

During the assembly steps given below handle the gyro unit very carefully to prevent damage to the fine threads on the unit.

(a) Place new ball bearings (13, figure 47K) in the two ball bearing adapters (12) and lock each in place with the bearing lock nuts (17), using two Adjustable Pin Wrenches 1000347.

(b) Thread one bearing adapter (12, figure 47K) into the gimbal bearing adapter so that it is at least two threads below the inside face of the bearing adapter.

(c) Mount the gimbal in the Gimbal Ring And Gyro Holding Fixture 1000366, and insert the assembled gyro unit into the gimbal. It may be necessary to rotate the gyro unit slightly so that its protruding parts will clear the gimbal. Handle carefully so as not to damage the threads and slip rings or scrape off any of the finish.

NOTE

Be sure that the gyro is correctly positioned. The pinch-off tube should be on the side with the cut in the gimbal and away from the bevel gear end of the gimbal.

(d) Insert the bearing adapter (23), sliding the bearing over the journal of the gyro unit. Align the clearance holes in the bearing adapter with the tapped holes in the gimbal and secure with the four fillister-head screws and lock washers.

CAUTION

Use extreme care in the next operation so that the bearing is not damaged or the gimbal distorted. Do not screw the bearing adapter in too far. At all times, until the final adjustment is made, there should be an end play of at least 0.003 inch.

(e) Screw in the bearing adapter (12) on the opposite side until the inner race makes contact with the shoulders on the journal of the gyro unit. The gyro unit should be so positioned that when the gyro journals are in a horizontal position the

gimbal is nearly balanced. This may be done by threading "out" the bearing adapter on the "light side" and threading "in" an equal amount the bearing adapter on the "heavy side". Assemble on the gyro unit the four balance screws and adjust them until the gyro unit is statically balanced in all positions.

(f) Rotate the gyro in the gimbal checking to see that there is clearance between all parts on the gyro unit (such as pinch-off tube and balance screws) and the gimbal. The stop on the gyro unit should meet the stop pins on the gimbal squarely when rotated 85 degrees in either direction from its normal position. At this time these requirements take preference over balance. The final balance is obtained in a later operation.

(g) Thread on the adjusting nut (11, figure 47K) until it makes contact against the bearing adapter and then back it off approximately three turns. Align the holes in the adjusting nut with the tapped holes in the bearing adapter and secure in place with the three fillister-head screws and lock washers.

(h) Assemble the inner bearing lock nut (16) on the bearing adapter side and lock the inner race of the ball bearing securely to the journal of the gyro unit. Check and make sure the bearings do not bind. If the end play becomes restricted, adjust the bearing adapter on the opposite side until the gyro unit is free in the gimbal.

(i) Thread the adjusting nut on the opposite side until it makes contact against the bearing adapter, then back it off approximately three turns. Align the holes and secure lightly with the three fillister-head screws and lock washers. Do not tighten the screws at this time.

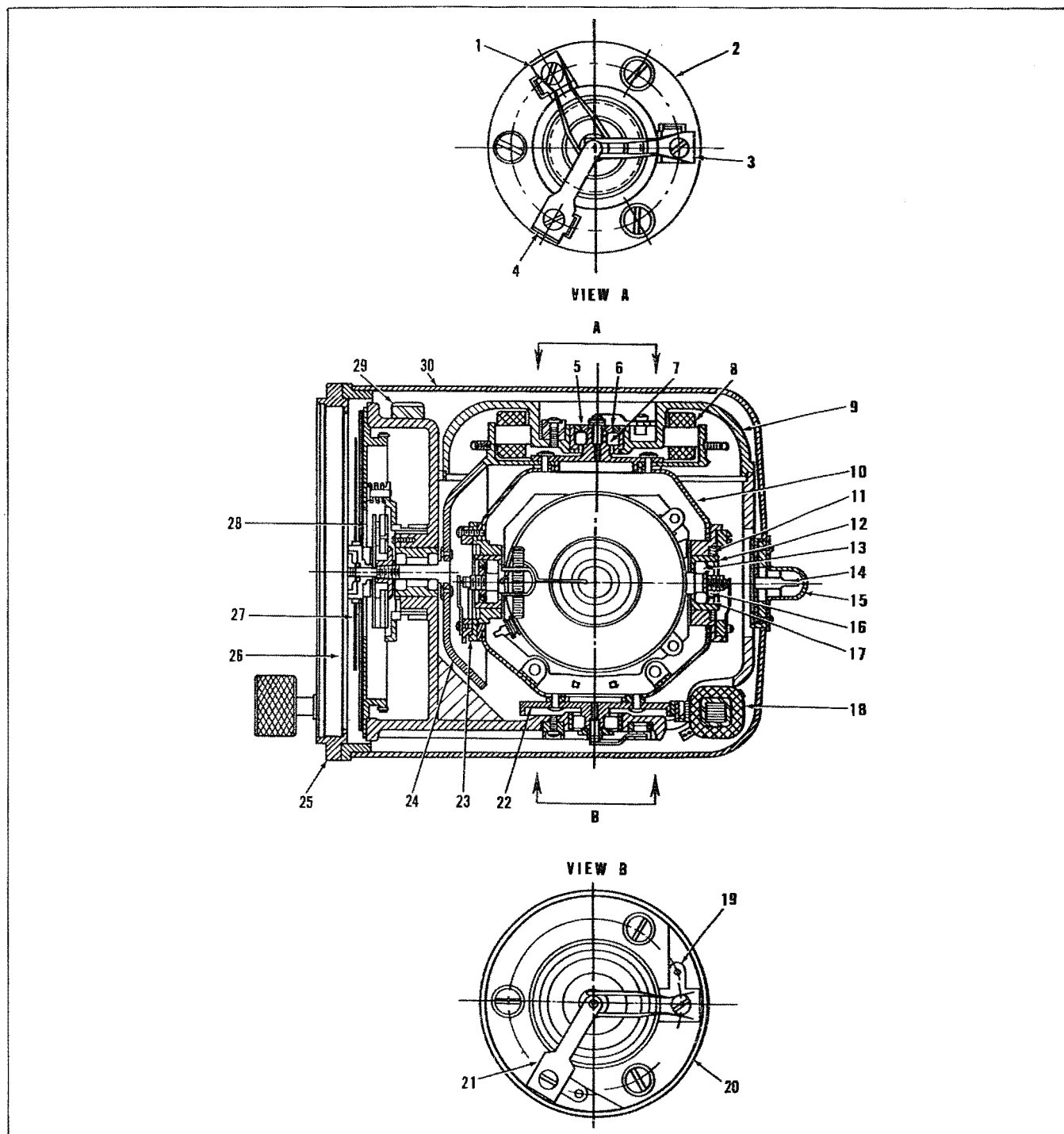
(j) Install the inner bearing lock nut (16) on the same side and securely lock the inner race of the ball bearing on the journal of the gyro unit. Check that the bearings do not bind and there is at least 0.003-inch end play as this operation is performed.

NOTE

For checking the end play of the gyro unit in the gimbal ring during the next operation an indicator post (figure 47L) should be threaded into either one of the two screw holes.

(k) Adjust both bearing adapters so that the end play of the gyro unit in the gimbal is between 0.0035 and 0.005 inch as the gimbal is rotated, first with one bearing down and second with the opposite bearing down. Check the end play by the weight of the gyro unit only.

(l) Lock the bearing adapters by tightening the three fillister-head screws on the



- | | | |
|--------------------|-----------------------------|------------------------|
| 1 Brush (E106) | 11 Adjusting nut | 21 Contact (E108) |
| 2 Holder and lug | 12 Bearing adapter | 22 Lower trunnion |
| 3 Brush (E105) | 13 Ball bearing | 23 Bearing adapter |
| 4 Contact (E104) | 14 Pinch-off tube | 24 Bevel gear |
| 5 Bearing lock nut | 15 Guard (pinch-off tube) | 25 Bezel |
| 6 Bearing lock nut | 16 Bearing lock nut (inner) | 26 Bezel glass |
| 7 Ball bearing | 17 Bearing lock nut (outer) | 27 Luminescent pointer |
| 8 Stator | 18 Spin down brake (L101) | 28 Luminescent dial |
| 9 Cap | 19 Brush (E107) | 29 Terminal block |
| 10 Gimbal | 20 Holder and lug | 30 Cover |

Figure 47K. AF Type C-50 Directional Gyroscopic Indicator, Cross-Sectional View.

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adjusting nut. Recheck the end play and readjust if necessary.

(m) Install the two brush assembly blocks (9, figure 38N and 14, figure 38P) and the two contacts (5, figure 38N and 7, figure 38P) and fasten them in place with the binding head screws. Be sure the color coding is correct.

(n) Place sleeving (No. 20, 7/8 inch long) on each lead of the two 1000-ohm ± 5 percent, 1/2-watt resistors. Cut and fit as shown (8 and 14, figure 38N) and solder to the terminal lugs. Resolder the wires to their corresponding terminal, observing the color code (figures 38N, 38P and 41B).

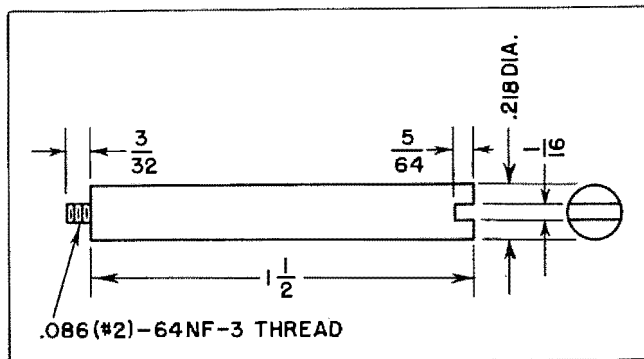


Figure 47L. Indicator Post

(o) The assembled gyro and gimbal must next be given a static balancing test as follows: Mount the assembled unit in the Static Balancing Fixture 1000363 and adjust the balancing screws until the gyro unit is balanced in all vertical and horizontal positions within the gimbal. Replace the weights and balancing screws on the gimbal, if removed, and adjust until the gimbal is balanced in all positions. The static balance of the gyro unit should be rechecked and the two balance screws located perpendicular to the spin axis should be secured in place with General Electric Glyptal No. 1201.

(7) REASSEMBLY OF THE FRAME ASSEMBLY.

(a) On instruments with serial numbers below 700 it may be necessary to add stand-off terminals (4, 5, and 6, figure 38H) corresponding to circuit points E109, E110, and E111 in figure 41B, especially if the coil of the spindown brake transformer is to be replaced or the noise suppression network is to be modified. The holes for the terminals should be drilled and tapped (No. 2-56 thread) before assembling the unit further.

(b) Install the two long shafts (2 and 9, figure 38X) and gears, using Pinning Pliers 1000345. Use Drilling and Pinning Fixture 1000341 for drilling new pin holes. Install the two short shafts (3 and 8, figure 38X). Use Drilling and Pinning Fixture 1000342 for drilling new pin holes.

NOTE

The above fixtures are designed to give the proper end-play of the shaft when both the shaft and gear hub are pressing against the fixture.

(c) Attach the inner fork, lever, and spring to the inner fork bracket (figure 38V). Mount the bracket on the frame, centralizing the pins with Setting Ring 1000427.

(d) Replace the large bronze gear and the four aluminum gears on the frame (figure 38W). Be sure the pins of the inner fork engage the groove in the large bronze gear.

(e) Attach the outer fork, lever, and spring to the outer fork bracket (figure 38V). Mount the bracket on the frame and fasten in place with two fillister-head screws.

(f) Reassemble the lower bracket with its crank-shaped shaft, spring, stop, two snap rings and gear (figure 38V). Mount the assembled bracket on the frame and fasten in place with the two fillister-head screws.

(g) The crank-shaped shaft must next be adjusted so as to operate with both the outer and inner forks. To make this adjustment loosen the set screw in the stop and turn the crank so that it will be over both forks. Tighten the set screw and bend the spring on the inner fork until it makes contact with the shaft. Adjust the stop and bend the spring on the outer fork until it also makes contact with the crank.

(h) Reassemble the shaft, gear, snap rings, and set screw on the "CAGED" flag bracket and attach the bracket to the frame with the two fillister-head screws and split lock washers.

(i) Place the two ball bearings in their housings and mount on the shaft of the bevel gear. Screw the clutch flange (6, figure 38V) on the shaft of the bevel gear and run up until the shaft has an end play of from 0.003 to 0.005 inch. Replace the lock nut (11, figure 38V) and lock tight.

(j) Insert into the frame, from the top, the assembled bevel gear and screw it into the frame, using the Backlash Adjusting Wrench 1000351. Attach the locking nut (hand tight) then back it off approximately one to three turns. Replace the three fillister-head screws but do not tighten them at this time.

(k) Attach the brush holder to the bottom of the frame. The assembly work on the frame is now completed.

c. REPLACING THE SUBASSEMBLIES.

(1) FRAME ASSEMBLY

(a) Mount the electrical components on the frame. Replace the cap and stator. Fasten it in place with one or more screws for wiring purposes. Route the leads and solder the connections, observing the color coding. (Differences in circuits are explained below.)

(b) Units with serial numbers below 1250 may have a different circuit than that shown in figures 41B. In earlier units two resistors (R101 and R102) are connected as a voltage divider across the secondary of coil L101. These units may be modified to the circuit shown in figure 41B by adding resistors R105 and R106, and changing resistor R101 from 100 ohms to 110 ohms. Resistor R102 was discontinued at the time this change was made. (See figure 38H for locating the circuit points.)

(c) Units with serial numbers above 1900 have an additional radio-frequency noise-suppression feature. This feature consists of four disk-type capacitors, one connected between each phase and the chassis at the terminal block (TB101), with two connected on the yellow terminal.

(d) When replacing the spindown-brake coil (L101) on units with serial numbers below 1350 it may be noted that the coil being replaced is equipped with terminals. If this is the case, the harness wire, which originally was connected between the yellow terminal of coil and the yellow terminal of the terminal block (TB 101), may be clipped. The green wire which was connected between the green terminal of the coil and the green terminal of the torquer stator (B102) may also be clipped. The leads of the new coil should be spot tied to the harness, using nylon lacing cord. Apply Glyptal to the knots to prevent loosening.

(2) GYRO AND GIMBAL ASSEMBLY.

(a) Insert the ball bearing in the cap and fasten in place with the outer bearing lock nut (5, figure 38J), using the Adjustable Pin Wrench 100047.

(b) Place the ball bearing on the lower trunnion of the gimbal and fasten in place with the bearing lock nut (4, figure 38H), using the Pin Wrench 1000425.

(c) Take out the screws holding the power failure indicator and the terminal block to the frame. Remove the fillister-head screws holding the cap and stator, and remove the cap from the frame (figure 47M), being careful not to damage the power failure indicator. Insert the upper trunnion of the gimbal assembly into the cap and stator and fasten with the inner bearing lock nut (6, figure 38J), using the Adjustable Pin Wrench 100047.

(d) Hold the spin-down brake out of the way and carefully insert the gyro and gimbal assembly in the frame, (figure 47N). See that the cap seats firmly on the frame and then fasten securely in place with the four fillister-head screws.

(e) Before mounting the power failure indicator turn the rotor approximately one turn clockwise. Fasten the power failure indicator in place with the two binding head screws. Locate the indicator so that the rotor turns freely from stop to stop.

(f) Mount the terminal block to the frame, using the four binding head screws.

Secure the wiring harness to the frame with the cable clamp and binding head screw.

(g) Adjust the backlash between the bevel gears so that the backlash does not exceed 0.005 inch, using the Backlash Adjusting Wrench 1000351 and threading the bearing holder in or out of the frame as necessary. Hold one gear and indicate on the other. Lock the bearing holder in place by tightening the three fillister-head screws.

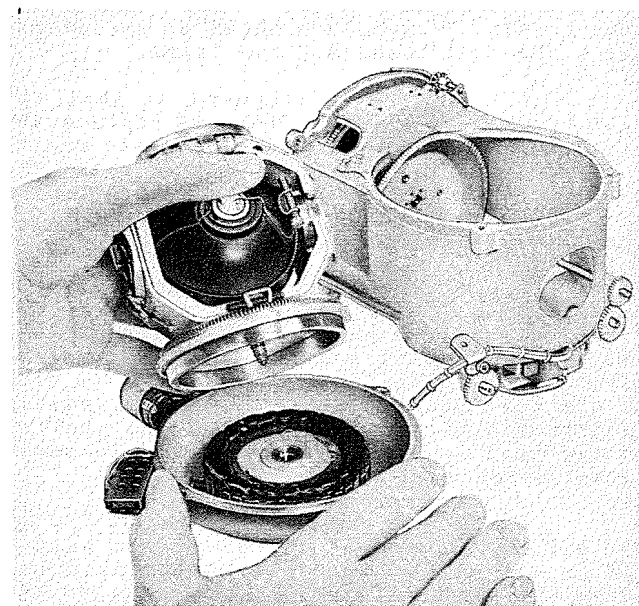


Figure 47M. Installation of Gyro and Gimbal Assembly Into the Cap and Stator.

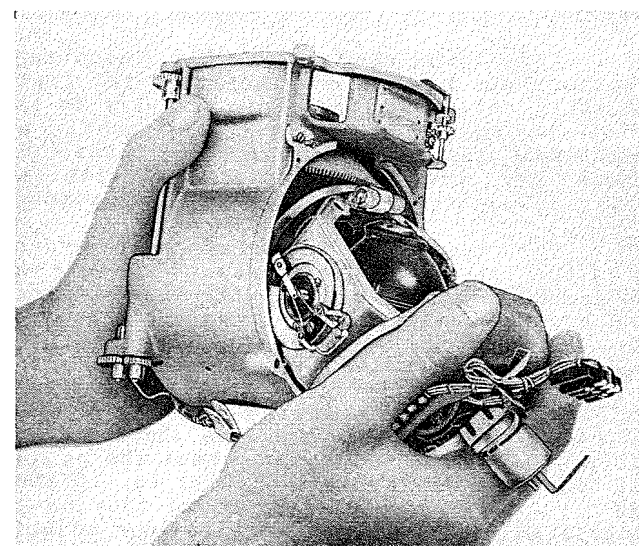


Figure 47N. Installation of Gyro and Gimbal Assembly. (Attached to Cap and Stator) Into the Frame

(h) Insert the pointer hub (5, figure 38G) through the hole in the luminescent dial and gear assembly (4) dial and attach the clutch disk (3) and shims to the pointer hub with the three fillister-head screws.

(i) Mount the dial and gear assembly and the dial disk (2) on the front of the frame by sliding the pointer hub on the shaft. Check that the pins on the back of the dial gear engage the holes and slot in the dial disk. Mount the dial bezel (6) and fasten it in place with the four binding head screws. Check the movement of the dial. It must rotate freely; if not, add shims as needed between the dial bezel and the frame.

(j) Turn the instrument so that the dial is upright (figure 38F) and replace the eight loose 1/16-inch balls around the shaft. Hold them in place with the pointer nut. The clutch disk must provide sufficient friction to drive the pointer; if not, add shims to the hub.

(k) The dash of clear lacquer on the pointer nut should be at the top when the gimbal is positioned as shown in figure 47K. If it is not, paint out the dash using a flat black lacquer (MIL-L-6805). Apply a new dash of clear lacquer (MIL-L-7178) approximately 1/16-inch long by 1/32-inch wide at the top of the pointer nut when the gimbal is positioned as shown in figure 47K.

(l) Replace the two brushes (1, 3, figure 47K) and the contact (4) on the holder (2) on the top of the instrument; also replace the brush (19) and contact (21) on the holder (20) on the bottom.

(3) BEZEL ASSEMBLY.

(a) Carefully clean both sides of the bezel glass, using a very soft lint-free cloth. Make certain the glass is absolutely dry.

(b) Insert the two rod and pin couplings in the ends of the short shafts of the frame assembly and attach the bezel assembly to the frame making sure the two output shafts of the bezel assembly engage with the couplings. Fasten the bezel assembly in place with the four fillister-head screws and lock washers.

(c) Loosen the screws of the levers of both the inner and outer forks. Pull both the "POINTER" knob and the "DIAL AND POINTER" knob out as far as they will go. Adjust the position of the two levers so that their rollers make contact with the lever heads on the top of the bellows. If it is necessary, adjust the lever eccentric using the Pin Wrench 1000348. Tighten the screws on the levers of both inner and outer forks. Test the motion of both knobs. When pushed full in, if they do not release the clutch, or if they cause excessive clutch travel, make further adjustments.

(4) CALIBRATION.

(a) Before the instrument is placed in the cover it must be calibrated and tested.

The procedure is given in Section VII, paragraphs 14 through 27.

(5) FINAL ASSEMBLY.

(a) Place the instrument close to the cover (figure 38D) and carefully slide the instrument partially into the cover, keeping the flange of the bezel approximately 1-1/4 inches away from the flange of the cover (figure 38C). Attach the three wires (yellow, green, red) to the rear terminals of the terminal block (TB101) with the three fillister-head screws.

NOTE

Clamp the three wires to the frame (on units not equipped with a filter) before sliding the instrument into the cover.

(b) Coat the flange of the cover with Minnesota Mining Sealing Compound EC-1130 and then slide the instrument completely into the cover. Replace the eight (or 16) fillister-head screws along the edges of the bezel.

(c) Bake the assembled instrument in an oven for one hour at a temperature of 180°F. (82.22°C) to cure the sealing compound.

(d) Test the assembled instrument for leaks as instructed in paragraph 3A.a.(3). If leaks are found, remove the instrument from the cover, and replace or repair any defective parts. Clean off all sealing compound on the flanges of the cover and bezel and repeat steps (b) and (c), above. Recheck for leaks to be absolutely certain the instrument can be hermetically sealed.

(e) To hermetically seal the instrument, attach a vacuum pump to the pinch-off tube (5, figure 38B) on the rear of the cover and exhaust at a pressure of approximately 15 inches of mercury absolute for three hours, heating the instrument continuously during the entire time at a temperature of 180°F (82.22°C). Discontinue heating and keep on exhausting instrument until its temperature has returned to a stabilized room temperature.

(f) Fill the unit to atmospheric pressure with nitrogen or the nitrogen-helium mixture. Evacuate to 1/4-inch mercury or less. Fill the instrument with a mixture of 90% helium and 10% nitrogen.

(g) Seal the pinch-off tube at a point not to exceed 3/8 inch from the base, using Tube Pinch-off Pliers 1000355. Solder the pinch-off tube with 60-40 solder and rosin flux, and coat with General Electric Glyptal 1201. Replace the pinch-off tube guard and fasten in place with the three fillister-head screws.

(h) Carefully clean off excess sealing compound along the edges of the bezel and cover and paint with a dull black lacquer.

SECTION VII
TEST PROCEDURE1. AF TYPE C-1 AND NAVY (STOCK NO.
R88-I-1006) INDICATORS.

1A. ROTOR STARTING TEST.

a. Power supply - 115-volt, 400-cycle, 3-phase ac.

NOTE

When checking the phase rotation, use a portable power supply checker T100671 or a phase sequence indicator T100567. When phase rotation is correct, the light labeled "BRIGHT" will show greater brilliance than the light labeled "DIM."

b. While observing the rotor, turn on the power supply to the instrument. The rotor must start instantly. If the rotor kicks but fails to start, immediately turn off the power supply. This condition indicates an open in one lead of the 3-phase power supply.

CAUTION

Continued application of less than three phases will cause the strator windings to burn out.

c. If the rotor kicks but does not start, look for opens at the contacts and at all soldered connections. Recheck for continuity. (See figure 41.)

d. The above tests may also be made by using the AF P-1 Tester, the operating panel of which is shown in figure 47P. To use the Tester proceed as follows:

(1) Connect the power lead (47B7487) to the four-pin receptacle of the Tester. Connect the receptacle end of the power lead to the four-pin plug of lead 47B7495. Disconnect the three-pin plug from the back of the Indicator and connect it to the receptacle of lead 47B7495.

(2) Turn Switch No. 1 of the Tester to the "POWER CHECK" position, turn Switch No. 5 to the "28V DC" position, and then turn on the power.

(3) After the rotor of the Indicator has come up to speed, read the voltmeter.

(4) Rotate Switch No. 5 to the three phases of the voltmeter and read the voltage on each phase. During this test the pointer of the voltmeter should read 115 ± 5 volts. The frequency of the 115-volt current should be 400 ± 16 cycles as indicated by the green light. If the red light comes on, the phase rotation is wrong and the power lead should be changed so that proper phasing is obtained.

(5) The wiring diagram of the AF P-1 Tester is given in figure 47Q.

2. CALIBRATION.

NOTE

When calibrating the unit, it must be subjected to vibration at a frequency of from 1,500 to 2,000 cycles-per-minute and in such a manner that a point on the unit (in a vertical plane) will describe a circle of not less than .002 nor more than .005 inch in diameter.

a. Mount the instrument in a suitable holding fixture. Connect it to a 115-volt, 400-cycle, 3-phase a-c power supply and run it for approximately one hour. Keep the cover in place on the instrument but do not secure it with its attaching screws.

b. Set the latitude compensator for the latitude in which the overhaul depot is located.

c. Precess the vertical gimbal until the latitude compensator faces directly toward the dial. Cage the instrument and rotate the dial to the "0" heading. Uncage the instrument and run it for 20 minutes.

NOTE

The gyro may be precessed to cause the dial to rotate counterclockwise by pressing down lightly on the balance weight end of the gyro.

d. After the 20-minute period, note the number of degrees and the direction in which the dial has drifted from its original setting. Adjust the knurled balance weight on the gyro unit until the drift from the "0" heading is no more than 2 degrees in 20 minutes.

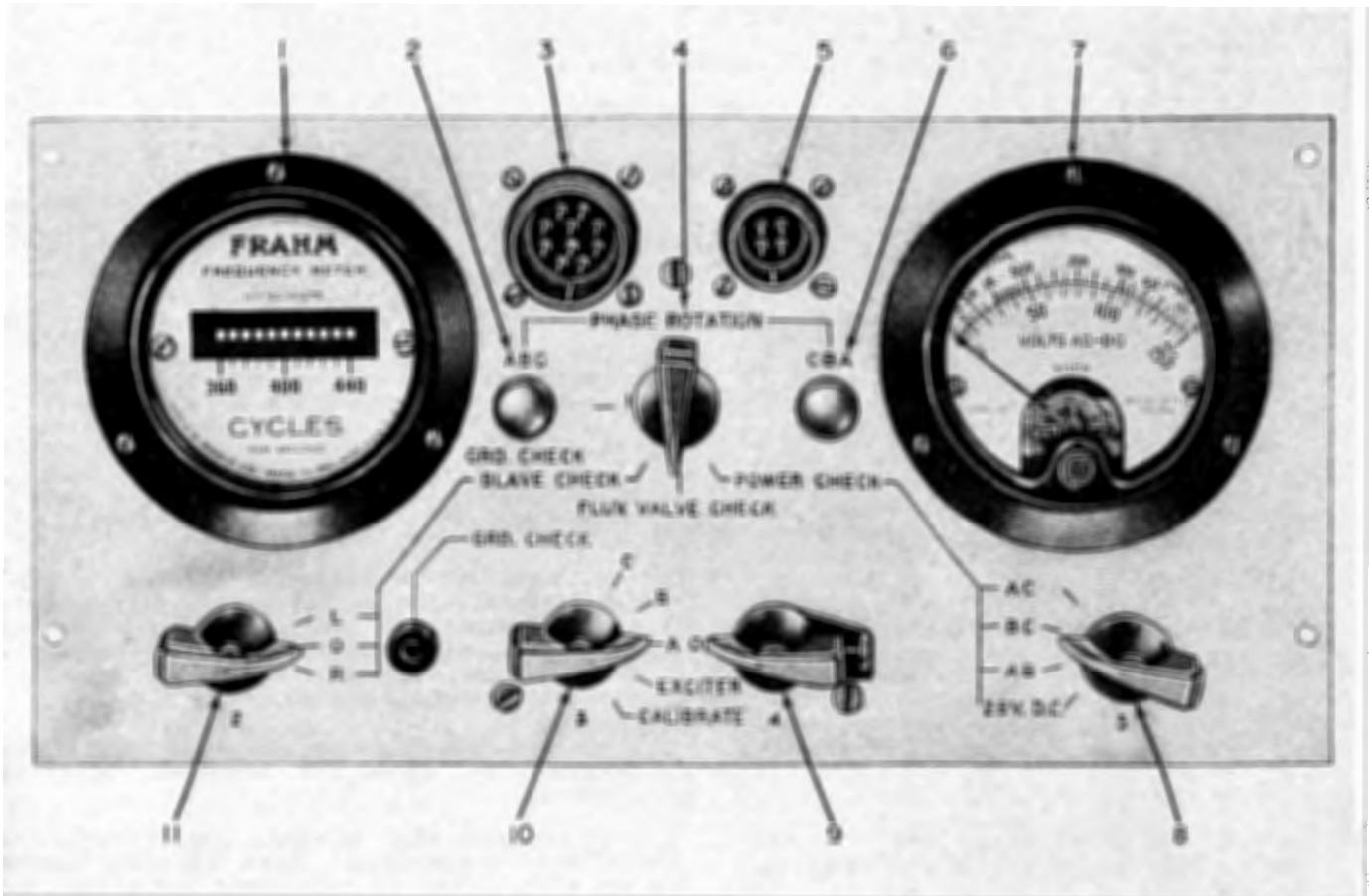
NOTE

To decrease drift in the minus direction (reading in degrees less than originally), move the balance weight (drift nut) away from the gyro; to decrease drift in the plus direction (reading greater than originally) move the balance weight (drift nut) toward the gyro.

e. Without turning the dial with respect to the dial gear, precess the gyro to the 90-, 180-, and 270-degree headings respectively, and record the amount of drift. The drift must not exceed 2 degrees in 20 minutes on any heading.

NOTE

The gyro may be precessed to cause the dial to rotate counterclockwise by



- | | | |
|-------------------------|-----------------------|------------------|
| 1 Frequency Meter | 5 Four-pin Receptacle | 9 Rheostat No. 4 |
| 2 Green Indicator Light | 6 Red Indicator Light | 10 Switch No. 3 |
| 3 Ten-pin Receptacle | 7 AC-DC Voltmeter | 11 Switch No. 2 |
| 4 Switch No. 1 | 8 Switch No. 5 | |

Figure 47P. AF P-1 Tester, Operating Control Panel

pressing down lightly on the balance weight end of the gyro.

3. BALANCE TEST.

NOTE

During this test the unit must be subjected to vibration at a frequency of from 1,500 to 2,000 cycles-per-minute and in such a manner that a point on the unit (in a vertical plane) will describe a circle of not less than .002 nor more than .005 inch in diameter.

a. With the gyro running, precess the gyro until the dial reads 45 degrees. Tilt the instrument 15 degrees to the left, uncage the gyro. At the end of a 10-minute period note

how much the gyro has drifted from its setting. The drift must not exceed 3 degrees in 10 minutes.

b. Repeat the test, tilting the instrument to the right.

c. Precess the gyro to the 90-degree heading and repeat the test, tilting the instrument to the left and to the right. The drift must not exceed 3 degrees in 10 minutes.

d. If the drift is excessive, check to see that the vertical gimbal and gyro bearings are free and that the tilt of the gyro is not impeded.

4. SCORSBY TEST.

a. After the instrument has been calibrated, mount it on the Scorsby table and allow it to run for 15 to 20 minutes.

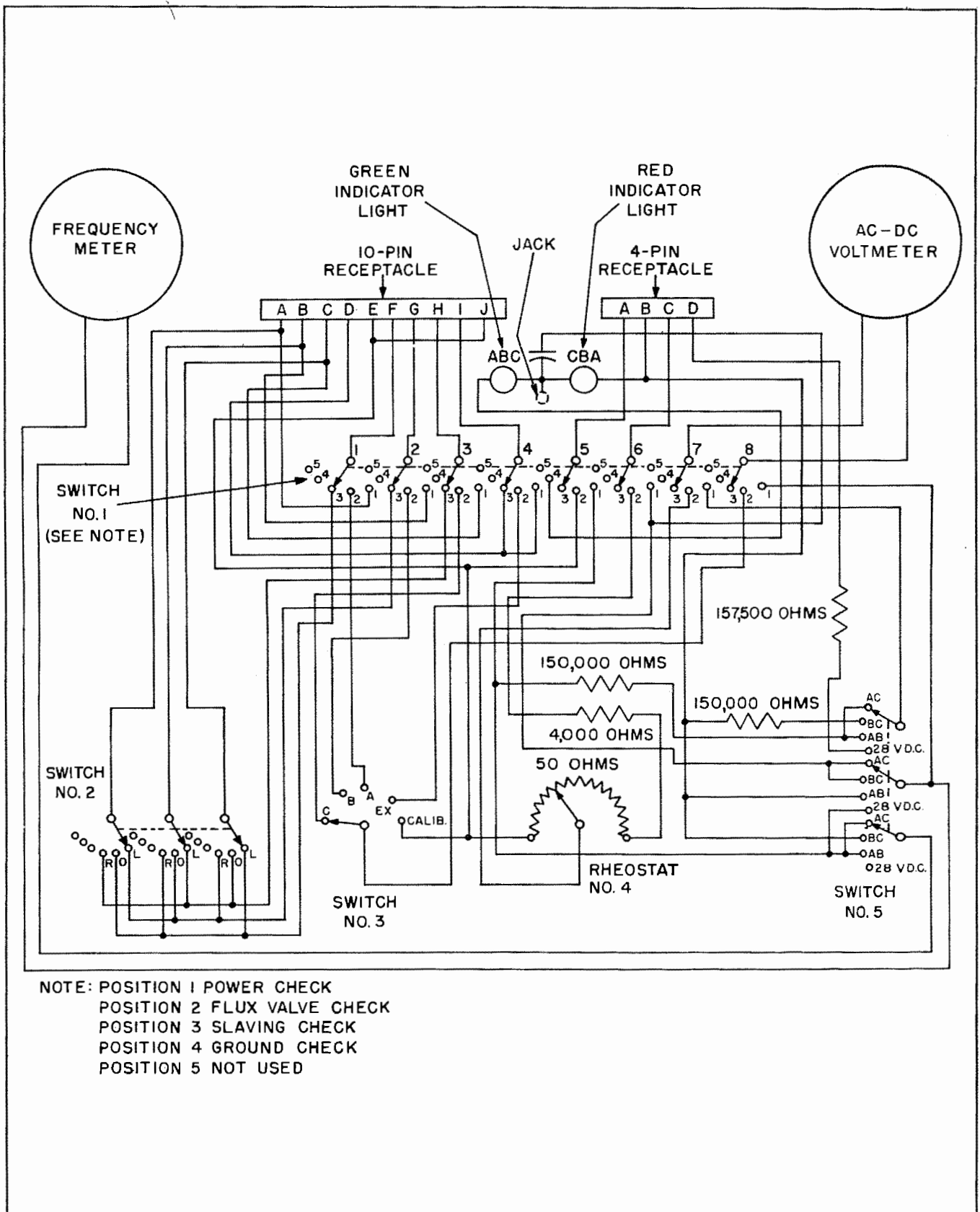


Figure 47Q AF P-1 Tester, Wiring Diagram

TABLE 2

DRIFT TOLERANCES FOR AF TYPE C-1 AND NAVY
(STOCK NO. R88-I-1006) INDICATORS

EXAMPLE 1		EXAMPLE 2		EXAMPLE 3	
Heading	Drift Degrees	Heading	Drift Degrees	Heading	Drift Degrees
0	5	0	5	0	5
90	-3	90	-3	90	-3
180	1	180	2	180	4
270	-3	270	-3	270	0
Total	12	Total	13	Total	12
Instrument Acceptable		Instrument Not Acceptable (Excessive Total)		Instrument Not Acceptable (Excessive drift from more than one heading)	

b. Precess the gyro to the "0" heading (latitude compensator toward the dial), and set the table to roll, pitch, and yaw 15 degrees (7-1/2 degrees each side of level) at approximately 5 to 7 oscillations per minute.

c. At the end of a 10-minute period, level the Scorsby table and check the amount of drift. The gyro must not drift more than 3 degrees in 10 minutes. If the drift is excessive, recheck the calibration as described in this section, paragraph 2.

5. BENCH TEST.

NOTE

During this test the unit must be subjected to vibration at a frequency of from 1,500 to 2,000 cycle-per-minute and in such a manner that a point on the unit (in a vertical plane) will describe a circle of not less than .002 nor more than .005 inch in diameter.

a. Precess the gyro until the latitude compensator faces the dial. Cage the gyro and set the dial to the "0" heading. Uncage the gyro and allow it to run for 15 minutes. At the end of the 15-minute period, record the amount that the gyro has drifted from its "0" heading.

b. Precess the gyro to the 90-, 180-, and 270-degree headings and record the amount of drift in 15 minutes.

c. The gyro must not drift more than 3 degrees in 15 minutes from any of the four cardinal headings. A maximum of 5 degrees from one heading is permissible, provided that the total drift from the four headings does not exceed 12 degrees. (See table 2.)

NOTE

When calibrating, the operator should endeavor to adjust the knurled balance weight so that the algebraic sum of the drift from all four cardinal headings is approximately zero. (That is, the total drift to the left should equal the total drift to the right.)

d. If the drift is erratic, it usually is due either to shifting mass or friction in the gyro bearings. The condition of the vertical gimbal bearings also has a definite effect upon the drift although to a lesser degree. Recheck the end-play and freedom of the component parts

6. AF TYPE C-5 AND NAVY (STOCK NO. R88-I-1006 -20 AND R88I1006-020-000) INDICATORS.

6A. ROTOR STARTING TEST.

a. Supply 115-volt ± 5 , 400-cycle ± 10 , 3-phase power to the instrument.

NOTE

When checking the phase rotation, use portable power supply checker T100671 (or T100567). When phase rotation is correct the light labeled "BRIGHT" will show greater brilliance than that labeled "DIM".

b. While observing the rotor, turn on the power supply to the instrument. The rotor must start instantly. If the rotor kicks but fails to start, turn off power immediately. Failure to start indicates an open in one lead to the stator or an open circuit at one of the contact assemblies on the trunnions.

CAUTION

Continued application of less than 3-phase power to the gyro will cause the windings to burn out.

c. Check for opens at the contacts and at all soldered connections. Recheck for continuity. (See figure 41A.)

6B. CALIBRATION.

6C. DRIFT CALIBRATION.

NOTE

All calibration must be performed after a warm-up period of one hour with the instrument operating on 115-volt \pm 3, 400 cycle \pm 20, 3-phase power.

a. Mount the instrument in Scorsby Adapter T100810 or T100815 and set it on Scorsby Table T100060 or T100925. Adjust the table to subject the instrument to a roll, pitch and yaw displacement of 2-1/2 degrees on both sides of the vertical at a frequency of five to seven oscillations per minute.

NOTE

On Navy (Stock No. R88I10006-020-000) Indicators, the latitude compensator should be set to the latitude in which the overhaul depot is located. On stock No. R88-I-1006-20 Indicators of Part No. 653290, it is necessary to withdraw the cover in order to make the latitude setting unless an inspection plate has already been added. On Stock No. R88I1006-020-000 Indicators of Part No. 674174, the latitude compensator is reached by removing the access cover.

b. Precess the gyro so that its contact end lies toward the bezel glass and its spin axis is perpendicular to it. Then set the pointer or dial to "0" heading.

c. Subject the instrument to the motion of the Scorsby for a period of 10 minutes. At the end of this period level the table and note the change in heading. The change should not exceed one degree.

d. If the reading has increased in excess of one degree in the plus direction (reading in degrees greater than originally), move the balance weight (drift nut) toward the gyro case. If the reading had decreased in excess of one degree in the minus direction (reading less than originally) move the weight (drift nut) away from the gyro.

NOTE

Changes in heading must be accomplished by precessing the gyro to move the gimbal ring with respect to the instrument case.

e. Repeat the procedure on the 90-, 180-, and 270-degree headings and make drift adjustments as necessary.

6D. BALANCE CALIBRATION.

a. Mount instrument in Turntable Adapter T100810 or T100815 and set adapter on Turntable T100503. Level the turntable, then precess the gyro for an indication of 45 degrees. Cage the instrument. Tilt the fixture 15 degrees to the right, uncage the instrument, and start the timer. At the end of a 10-minute period, note how much the gyro has drifted from the original setting. The drift must not exceed two degrees.

b. If the limit of drift is exceeded in the minus direction (reading in degrees less than originally) move the sliding weights on the contact side (front) of the gyro downward slightly. If the limit of drift is exceeded in the plus direction (reading in degrees greater than originally) move the sliding weights upward slightly.

c. Repeat step a., again tilting the instrument to the right.

cA. Repeat step a., tilting the fixture 15 degrees to the left.

cB. If the limit of drift is exceeded in the minus direction (reading in degrees less than originally) move the sliding weights on the contact side (front) of the gyro upward slightly. If the limit of drift is exceeded in the plus direction (reading in degrees greater than originally) move the sliding weights downward slightly.

cC. Repeat step a., tilting the fixture 15 degrees to the left.

d. If any of the calibration adjustments furnish erratic results, the static balance must be rechecked and the instrument again calibrated.

e. If the calibration has been satisfactory so far, recheck the drift calibration as described in paragraph 6C.

6E. GYRO CARD STABILITY CALIBRATION.

a. Mount instrument in Turntable Adapter T100810 or T100815 and set adapter on Turntable T100503. Uncage the instrument and tilt it 55 degrees to either the right or left. Rotate it one complete revolution at the rate of 180 ± 10 degrees per minute. The drift after one revolution should not exceed 1-1/2 degrees. Repeat the test, rotating the Indicator in the opposite direction.

b. If the drift limit is exceeded in the minus direction (reading in degrees less than originally) shift the screw weights in the up-right sides of the gimbal toward the back or away from the contact end of the gyro. If the drift limit is exceeded in the plus direction (reading in degrees greater than originally) shift the screws toward the contact side of the gyro.

7. TEST AND TEST CONDITIONS.

a. **POWER SUPPLY.** The tests shall be performed with the Indicator operating from a 3-phase supply of 115 ± 5 volts and 400 ± 10 cycles.

b. **ATMOSPHERIC CONDITION.** Unless otherwise specified, all tests are to be made at atmospheric pressure (approximately 29.92" mercury) and at room temperature (approximately 25°C).

c. **VIBRATION.** All tests, except those involving roll, pitch, and yaw, must be performed with the instrument subjected to a vibration between .002 and .005-inch amplitude in a vertical plane with a frequency of 1,500 to 2,000 cycles-per-minute.

d. **HEADING ADJUSTMENT.** Before performing any of the tests that specify operation on a definite heading, the following procedure should be followed:

(1) Precess the vertical gimbal by pressing down or lifting up the end of the gyro spin unit, until the gyro spin axis is perpendicular to the bezel glass with the contact end of the gyro unit facing the glass.

(2) Cage the gyro. Set "0" of the Navy Indicator under the lubber line or align the pointer of the Type C-5 Indicator with the vertical index.

(3) Uncage the gyro. On the Type C-5 Indicator, set the "0" of the dial under the vertical index.

(4) This relationship between indices and gimbal ring should be maintained on all headings throughout the tests.

e. **WARM-UP PERIOD.** All tests are to be performed after the Indicator has been operating on rated power supply for one hour.

NOTE

If the rotor does not start when power is applied, turn off the power immediately and check for opens in the power supply. Continued application of less than three phases will cause the stator windings to burn out.

8. **POWER CONSUMPTION TEST.** After three minutes of operation, the current in any one leg of the supply to the Indicator shall not exceed 200 ma, as measured on a 400 cycle milliammeter.

9. **BALANCE TEST.**

a. With the Indicator mounted on Turntable T100503, revolve the Indicator about a vertical axis until the pointer indicates 45 degrees.

b. Cage the gyro and tilt the Indicator 15 degrees to the right.

c. Uncage the gyro, and observe the drift over a ten minute period. The drift should not exceed 3 degrees in that elapsed time.

d. Tilt the gyro, 15 degrees to the left, and repeat the test.

9A. **NAVY INDICATOR CARDINAL POINT STABILITY (BENCH) TEST.**

NOTE

This test is applied to Navy (Stock No. R88I1006-020-000) Indicators only.

a. Precess the gyro until the latitude compensator faces the dial and the spin axis of the gyro is perpendicular to it. Cage the gyro and set the dial to "0" heading. With the instrument subjected to standard vibration, uncage the gyro and operate it for 20 minutes. Observe it at 5-minute intervals, and at the end of the 20-minute period record the amount it has drifted from the "0" heading.

b. Precess the gyro to the 90-, 180-, and 270-degree headings and again record the drift for the elapsed time.

c. The gyro must not drift more than 3 degrees from any one cardinal heading in 15 minutes.

10. **HIGH ANGLE SCORSBY (ROLL, PITCH, AND YAW) TEST.**

a. Mount the Indicator on a Scorsby which will subject it to a 15-degree (7-1/2 degrees on either side of the level position) roll, pitch, and yaw motion at a frequency of 5 to 7 oscillations per minute.

b. With the Indicator indicating 0 and the gyro uncaged, subject the Indicator to the motion of the Scorsby for 15 minutes. At the end of this period, the drift shall not exceed 3 degrees.

c. Rotate the Indicator about a vertical axis until the pointer indicates 90 degrees, and repeat the test.

11. **LOW ANGLE SCORSBY (AF CARDINAL POINT STABILITY) TEST.**

NOTE

This test is applied to Navy (Stock No. R88I1006-020-000) Indicators only.

a. For AF Type c-5 Indicators, adjust the amplitude of the Scorsby motion to 2-1/2 degrees (1-1/4 degrees on either side of the level position) in roll, pitch, and yaw, and check the drift of the gyro on 0-, 90-, 180-, and 270-degree headings. The drift should not exceed 2 degrees in 15 minutes on any heading.

b. For Navy (Stock No. R88-I-1006-20 and R88I1006-020-000) Indicators, adjust the amplitude of the Scorsby motion to 3 degrees (1-1/2 degrees on either side of the level position) in roll, pitch, and yaw. Check the drift of the gyro on 0-, 90-, 180-, and 270-degree headings. The drift should not exceed 2 degrees in 15 minutes on any heading.

12. LEVELING TEST.

a. With the Scorsby in motion of 2-1/2 degrees in roll, pitch, and yaw, tilt the gyro from the level position to the limits of freedom and observe for a smooth continuous leveling action from both sides into within 5 degrees of horizontal.

13. GYRO CARD STABILITY TEST.

- a. Mount the Indicator on Turntable T100503.
- b. Uncage the gyro, and tilt the table 55 ± 1 degree right or left from the vertical.
- c. Revolve the Indicator through one complete revolution at a rate of between 180 and 360 degrees per minute. The drift, after one revolution, should not exceed 2 degrees.
- d. Repeat, revolving the Indicator in the opposite direction.

14. TEST PROCEDURE FOR AF TYPE C-5C
DIRECTIONAL GYROSCOPIC INDICATOR.

CAUTION

Ground the chassis to avoid shock on all tests.

a. The procedure for testing the AF Type C-5C Directional Gyroscopic Indicator before opening the instrument or after close-up is given in paragraphs 15 through 23.

b. The procedure for testing and calibrating the AF Type C-5C Directional Gyro after repair or overhaul, before close-up is given in paragraphs 15 through 27.

15. STANDARD TEST CONDITIONS.

a. SCORSBY TESTS. To make the following tests use the Scorsby equipment, or equivalent listed in Section VI, paragraph 1c.

(1) TWO AND ONE-HALF DEGREES ROLL, PITCH, AND YAW TEST. The Scorsby equipment or equivalent, roll, pitch, and yaw testing device shall be set to roll, pitch, and yaw 2-1/2 degrees (1-1/4 degrees on either side of the level or reference position). The Scorsby shall provide five to seven oscillations per minute while reversing every sixth revolution.

(2) FIFTEEN DEGREES ROLL, PITCH, AND YAW TEST. The Scorsby equipment or equivalent roll, pitch, and yaw testing device shall be set to roll, pitch, and yaw 15 degrees (7-1/2 degrees on either side of the level or reference position). The Scorsby shall provide five to seven oscillations per minute while reversing every sixth revolution.

b. DRIFT READINGS. All readings for determining the drift of the gyro while mounted on the Scorsby equipment should be taken with the Scorsby equipment running in the same direction, to eliminate the effect of backlash in the Scorsby mechanism. The reading to be recorded should be the maximum azimuth reading (the maximum clockwise position of the pointer.)

c. POWER SUPPLY. The tests should be performed with the instrument operating from a 3-phase, 400 ± 10-cycle, 115 ± 5-volt, a-c power supply unless otherwise specified.

d. ATMOSPHERIC CONDITION. All tests are to be made at atmospheric pressure, and at a room temperature of approximately 78°F (25.56°C) unless otherwise specified.

16. ROTOR STARTING TEST.

a. Apply a 115-volt, 400-Cycle, 3-phase alternating current to the instrument. Observe the power failure indicator "OFF" flag when turning on the power. The flag should snap up immediately when the power is applied. The operator should listen carefully to determine if the gyro starts. Within a few seconds the gyro should start to exhibit rigidity. If it does not, turn off the power.

b. The rotor of the gyro should attain a speed of 375 revolutions per second minimum. The speed of the gyro may be determined by measuring the frequency of the back voltage immediately after turning off the power. To make this test use a Stroboconn (C.G. Conn Ltd., Elkhart, Indiana) or equivalent, connected as shown in figure 47R.

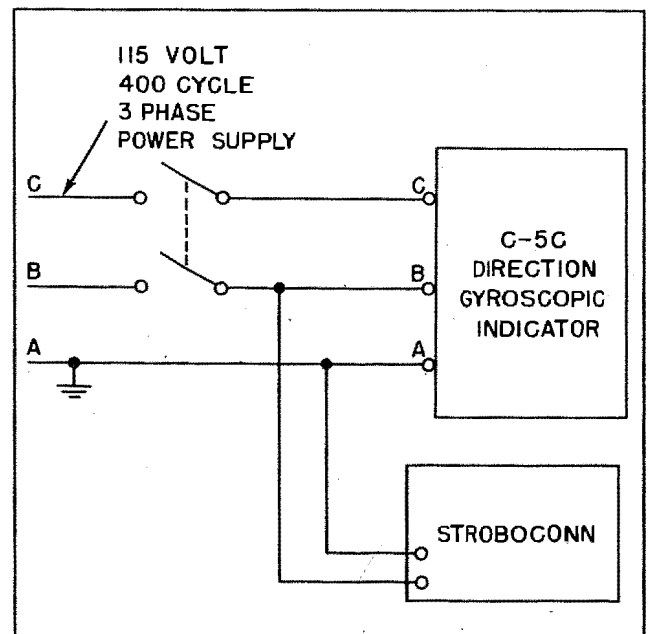


Figure 47R. Setup for Checking Gyro Rotor Speed.

17. OPERATING CURRENT TEST.

a. After three minutes of operation the current in any one leg of the power supply to the instrument should not exceed 200 milliamperes (.20 ampere) with 115 volts, 400 cycles supplied.

18. POWER FAILURE INDICATOR TEST.

a. When three-phase power is applied to the instrument, the "OFF" flag of the power failure indicator should disappear. Open successively each leg of the power line and observe the "OFF" flag; it should come into view as each leg is opened.

19. LOW VOLTAGE.

a. Apply a 103 ± 2 -volt, 400-cycle, 3-phase power supply to the instrument. With this voltage maintained, the indicator must pass the test specified in paragraph 21, except that the drift shall not exceed ± 7 degrees per hour.

b. The "OFF" flag of the power failure indicator should go out of view and remain out of view on this test.

20. LOW ANGLE SCORSBY TEST.

a. Mount the instrument on Scorsby equipment (refer to Section VI, paragraph 1c.) so that the instrument may be indexed through 360 degrees rotation about the vertical axis in 90-degree steps. The Scorsby equipment should be set to $2\text{--}1/2$ degrees of roll, pitch, and yaw.

b. Set the pointer to the four-degree heading. Be sure both knobs are pulled out after setting the pointer. Allow 15 minutes of operation before taking drift readings. The drift during any 30-minute period should not exceed three degrees. If the instrument is tested at any latitude other than that at which it was calibrated the earth's rate effect must be taken into account in the results.

c. Without changing the pointer setting turn the instrument 90 degrees. The pointer should be approximately on the 94-degree heading. Repeat the test applying the same limits. The same procedure should be followed, successively turning the instrument to the 184-degree and the 274-degree headings.

21. HIGH ANGLE SCORSBY TEST.

a. Mount the instrument on Scorsby equipment (refer to Section VI, paragraph 1c) and adjust it to provide 15 degrees roll, pitch, and yaw. (The Scorsby displaced $7\text{--}1/2$ degrees from the horizontal.)

b. Set the pointer to the four-degree heading and allow at least 15 minutes operation with the Scorsby equipment in motion before taking drift readings. If the instrument is tested at a latitude other than that at which it was calibrated the effect of earth's rate must be taken into account. The drift after allowing for this effect should not exceed three-degrees in any 30-minute period.

c. Without setting the pointer turn the instrument 90 degrees (the pointer should be approximately on the 94-degree heading) and repeat the above test.

22. (Deleted.)

23. DIELECTRIC TEST.

a. Subject the instrument to a dielectric test of 250 volts dc applied between each terminal and the indicator case. The resulting current after a period of five seconds should not exceed 0.25 milliamperes.

24. LEVELING TEST.

a. Mount the Indicator on Gyro Leveling Test Fixture 1000410. Connect the power supply to the terminal board. (Ground the chassis to avoid shock.)

b. Precess the gyro so that the horizontal trunnion axis is in line with the fore and aft axis of the Indicator. Swing the bracket holding the transparent plastic gauge into place. Adjust the gauge so that the zero lines are in the center of the journal, viewing the end of the journal through the gauge and the opening in the rear of the indicator frame.

c. Swing the gauge out of the way and precess the gyro so that the spin axis is in line with the fore and aft axis of the Indicator.

d. With the gauge in place, observe whether the gyro becomes level within ± 5 degrees (spin axis should be 90 ± 5 degrees to the vertical axis).

e. If the gyro is not level, the brushes should be adjusted accordingly by moving the brush block and bending the brushes. For convenience, adjust one brush at a time. This may be done by isolating the other brush and slipping a thin piece of lint-free insulating material (such as cellophane) between the brush and the slip ring. An a-c voltmeter connected to the black and white terminals of the leveling torquer (B102) will facilitate making the adjustment. When the brush is making contact with the conducting segment of the leveling switch, the voltmeter will read approximately 4.5 volts. When the brush is not making contact, the voltmeter will read approximately zero volts. The leveling switch should break contact when the gyro is within a few degrees of the level position. Bend the brushes as shown in figure 47R-1.

f. After the brushes have been adjusted, precess the gyro to the limits of freedom (85 degrees from level position). The gyro should level smoothly and continuously to within five degrees of the level position at a rate of 5 ± 2 degrees per minute.

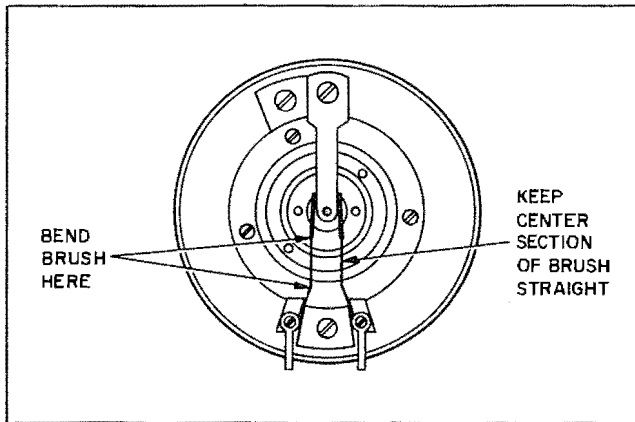


Figure 47R-1. Method of Bending Brushes

25. CALIBRATION.

a. Mount the instrument on Scorsby equipment (refer to Section VI, paragraph 1g.) and subject it to 2-1/2 degrees of roll, pitch, and yaw.

b. Push the POINTER knob "in" and set the pointer to any convenient heading. Be sure to pull both knobs "out" after setting pointers. With the Scorsby equipment in motion allow the instrument to run for at least 15 minutes before taking readings.

c. For best results take drift readings at 15 or 30-minute intervals for at least three hours without changing the pointer setting.

d. From the above readings determine the average drift. Adjust the calibration screws after the three-hour run to bring the drift within the required limits. The drift during any 30-minute period should not exceed the limits as determined from the following formula:

$$\text{Drift Limit} = (4.9 - 7.5 \sin L) \pm 3^\circ,$$

where "L" is the latitude of the test location (consider a south latitude minus).

This formula is based on the fact that the instruments are calibrated for zero observed drift at the latitude of the manufacturer's facility (40°45' North Latitude). Latitude corrections calculated by this formula are given in figure 47S.

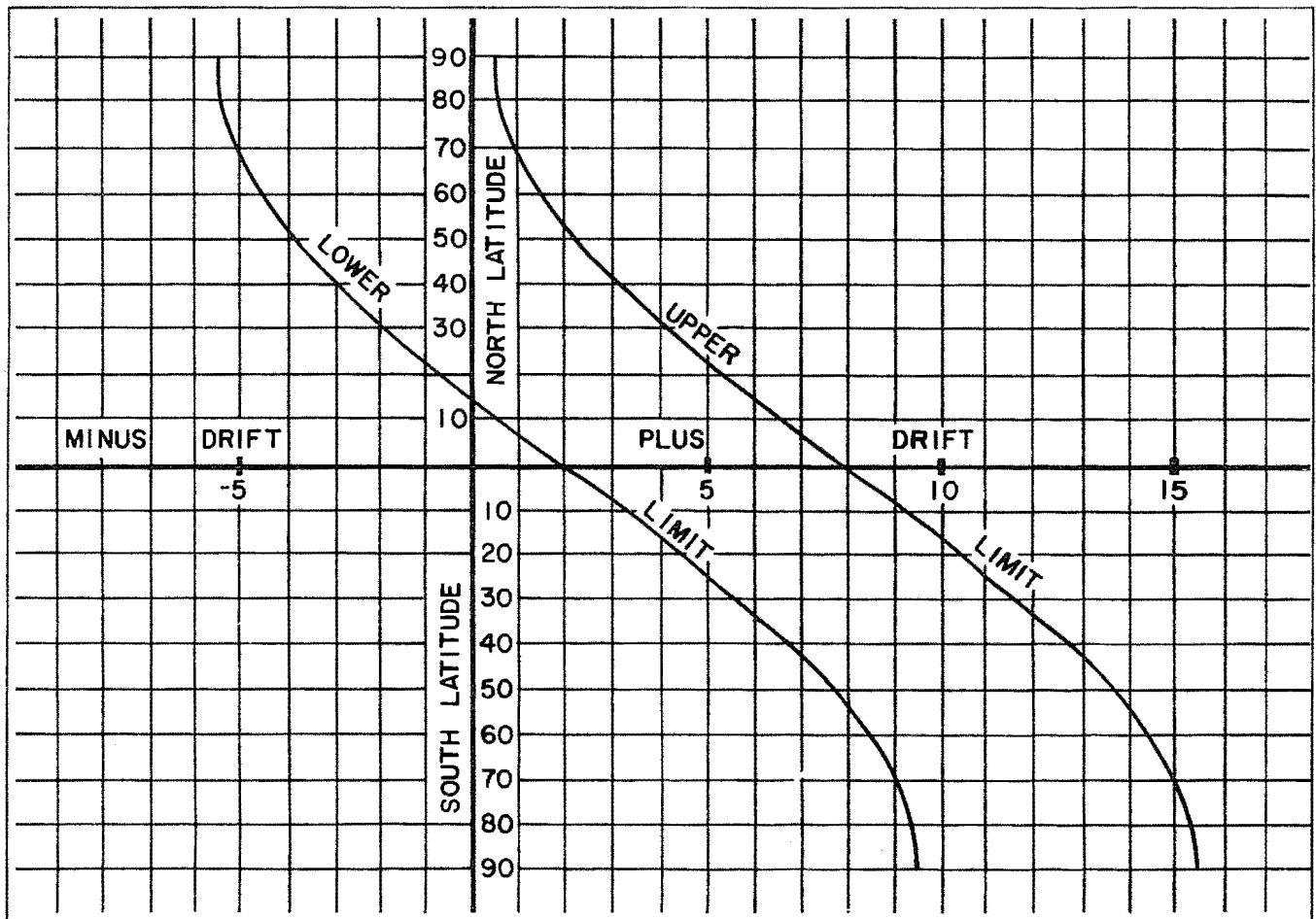


Figure 47S. Latitude Correction of Drift Limits for 30-Minute Period

NOTE

One full turn of one calibration screw will correct for a drift rate of four degrees per hour. To correct for a clockwise (plus) drift, turn the calibration screws in (clockwise) looking at the "red" terminal of the gyro unit. For a counterclockwise (minus) drift, turn the screw out (counterclockwise) looking at the "red" terminal of the gyro unit.

NOTE

The dash mark on the pointer nut should be aligned with the 90-degree or 270-degree index when the gimbal is in the correct position (for reference).

26. GIMBAL LOCK DRIFT TEST.

a. Mount the instrument on the Loop and Roll Tester 1000343. The gyro spin axis should be so positioned that the gimbal lock occurs when the fore and aft axis of the instrument is vertical.

b. The instrument should be made to simulate a complete 360-degree loop at a rate of approximately 15 degrees per second. The test should be repeated with the gimbal turned 5, 10, 15, 30, and 45 degrees on each side of the first position. The drift during any of the tests should not exceed five degrees.

27. (Deleted.)

TABLE 3. LATITUDE CORRECTIONS

LATITUDE (DEGREES)	TOP TILTED NORTH 15 DEGREES		TOP TILTED SOUTH 15 DEGREES	
	MINUS LIMIT (DEGREES)	PLUS LIMIT (DEGREES)	MINUS LIMIT (DEGREES)	PLUS LIMIT (DEGREES)
20°N	-3.4	+2.6	+1.1	+7.1
30°N	-3.6	+2.4	-0.2	+5.8
40°N	-4.4	+1.6	-1.4	+4.6
50°N	-5.1	+0.9	-2.6	+3.4

PARTS CATALOG

SECTION VIII

INTRODUCTION

1. This Parts Catalog lists, describes and illustrates the parts of the Directional Gyro Indicators listed below, which are manufactured by the Sperry Gyroscope Company, Division of The Sperry Corporation, Great Neck, New York.

<u>Nomenclature</u>	<u>Part No.</u>	<u>AF Type</u>	<u>Navy Stock No.</u>
Directional Gyro (Turn Indicator)	657069	C-1	-
Directional Gyro Indicator	661560	-	R88I1006
Directional Gyro Indicator	652191	C-5	-
Directional Gyro Indicator	653290	-	R88I1006-20
Directional Gyro Indicator	674174	-	R88I1006-020-000
Directional Gyro Indicator	674090	C-5C	-

2. Due to constant engineering changes which have taken place in the design of Turn Indicator Type C-1, two typical models are chosen to cover the listing of the parts. These are found on pages 36 through 46 inclusive and on pages 47 through 62 inclusive. The user of this parts catalog will employ the Group Assembly Parts List which comes closest to fitting the instrument for which replacements are being requested.

3. The parts for Directional Gyro Indicator, Navy Stock No. R88I1006 are listed on pages 63 through 78 inclusive.

3A. The parts of the Directional Gyro Indicator Type C-5 are listed on pages 79 through 96 inclusive.

3B. The parts of the Directional Gyro Indicators, Navy Stock No. R88I1006-20 and R88I1006-020-000 are listed on pages 97 through 109 inclusive.

3C. The parts of the Directional Gyro Indicator Type C-5C are listed on pages 110 through 120 inclusive.

4. Section IX, the Group Assembly Parts List contains illustrated breakdown of assemblies and subassemblies of each of these typical indicators. The system of indentation is used to show the relationship of the detail parts to subassemblies and the relationship of subassemblies to major or the main assemblies.

5. Section X, the Numerical Parts List, is provided to show all the part numbers called for in the Group Assembly Parts List. Opposite the part number is shown the figure and index number thus providing the necessary cross-reference between the Numerical Parts List and the Group Assembly Parts List.

6. Section XI, the Standard Parts List, provides a separate listing of all Standard Army

and Navy parts called for in the Group Assembly Parts List, and the total quantity of each used per instrument.

7. Symbols used in this catalog and their meanings are:

Letters (A, B, C etc.) are used in place of Index Numbers where a separate drawing has been prepared. Double letters indicate the breakdown that appear on the same sheet.

* Indicates non-procurable and non-illustrated detail component parts which are listed for reference only. The assemblies composed of these parts are procurable and are illustrated as assemblies only.

8. Certain parts, which have not been assigned part numbers but are purchased subject to Sperry Standard Parts Manual Specifications calling for extremely close tolerances, are identified in the Part Number Column of pages 47 through 109 with word Ref (Reference). The Sperry Specification number is added at the end of the nomenclature. When ordering these parts a full nomenclature, including exact sizes, type of material and the Sperry Specification number (as listed in the Nomenclature Column) must be furnished.

9. All parts which are available for purchase from manufacturers other than the Sperry Gyroscope Company are listed under their manufacturer's part numbers. To conserve space only the corresponding Sperry part numbers are listed in the nomenclature column of Group Assembly Parts List on pages 47 through 109 inclusive. The list of these manufacturers and their identifying symbols is found below.

LIST OF MANUFACTURERS

<u>Symbol</u>	<u>Name and Address</u>
ATA	Atlas Ball Division SKF Industries, Inc. Philadelphia, Pennsylvania
AXS	Allmetal Screw Products Co., Inc. New York, New York
BDX	Barden Corp. Danbury, Connecticut
CAFK	Centerless Grinding Co. Bridgeport, Connecticut
CED	Cannon Electric Development Co. Los Angeles, California
EM	Eaton Mfg. Co. Massillon, Ohio
EN	Elastic Stop Nut Corp. of America Union, New Jersey

LIST OF MANUFACTURERS (cont)

Symbol	Name and Address	Symbol	Name and Address
FS	The Fulton Sylphon Co. Knoxville, Tennessee	SPR	Sprague Electric Co. North Adams, Massachusetts
JNS	Howard B. Jones Division Cinch Mfg. Corp. Chicago, Illinois	SPS	Standard Pressed Steel Co. Jenkintown, Pennsylvania
LUNN	Lunn Laminates, Inc. Glen Cove, New York	SUR	Surprenant Mfg. Co. Boston, Massachusetts
MANF	F. N. Manross & Sons Division of Associated Springs Corp. Bristol, Connecticut	TBC	Thompson-Bremer and Co. Chicago, Illinois
ND	New Departure Division General Motors Corp. Bristol, Connecticut	TJL	Judson L. Thomson Mfg. Co. Waltham, Massachusetts
NL	The National Lock Washer Co. Newark, New Jersey	WD	The S. S. White Dental Mfg. Co. Philadelphia, Pennsylvania
PK	Parker Kalon Corp. New York, New York	WFRC	The Franklin C. Wolfe Co. Beverly Hills, California
ROCA	Rome Cable Corp. Rome, New York	WIQ	Winchester Electronics Co. Glenbrook, Connecticut
		WKI	Waldes-Koh-I-Noor, Inc. Long Island City, New York
		ZE	Zierick Mfg. Corp. New York, New York

SECTION IX—GROUP ASSEMBLY PARTS LISTS

FIG. NO.	INDEX NO.	STOCKED	GROUP Aircraft Instruments							UNITS PER ASSY	PROPERTY CLASSIFICATION		
			MAJOR ASSEMBLY Turn Indicator Type C1 No. 657069-L								U.S. NAVY	U.S. ARMY	BRITISH
			PART NUMBER	1	2	3	4	5	6				
48	A	-	657069-L							1		05-C	106A
			649552-H							1		05-E	106JB
48	-	-	649544							1		05-E	106JB
48	1	-	78904							1		05-E	106JB
48	2	-	804843							1		05-E	106JB
48	3	-	199363							1		05-E	106JB
48	4	-	199365							1		05-E	106JB
48	-	-	199348							1		05-E	106JB
48	-	-	199349							1		05-E	106JB
48	-	-	199347							1		05-E	106JB
48	-	-	199350							1		05-E	106JB
48	-	-	199351							1		05-E	106JB
48	-	-	199352							1		05-E	106JB
48	5	-	501C2-3							2		29	106JB
48	6	-	804884							1		05-E	106JB
48	7	-	199575							3		05-E	106JB
48	8	-	501C2-4							3		29	106JB
48	9	-	AN935-2							3		29	128
48	10	-	804881							1		05-E	106JB
48	-	-	199582							1		05-E	106JB
48	-	-	199581							1		05-E	106JB
48	-	-	H-149							2		29	106JB
48	-	-	804882							1		05-E	106JB
48	11	-	199577							1		05-E	106JB
48	12	-	199576							1		05-E	106JB
48	13	-	199579							1		05-E	106JB
48	14	-	210028							1		05-E	106JB
48	-	-	199578							1		05-E	106JB
48	-	-	210027							1		05-E	106JB
48	15	-	501C4-4							4		29	106JB
48	16	-	AN935-4							4		29	128
48	-	-	649545							1		05-E	106JB
48	17	-	804871							1		05-E	106JB
48	18	-	804870							1		05-E	106JB
48	-	-	199475							18		05-E	106JB
48	19	-	199476							3		05-E	106JB
48	20	-	193159							3		05-E	106JB
48	2	-	804843							1		05-E	106JB
48	3	-	199363							1		05-E	106JB
48	4	-	199365							1		05-E	106JB
48	-	-	199348							1		05-E	106JB
48	-	-	199349							1		05-E	106JB
48	-	-	199347							1		05-E	106JB
48	-	-	199350							1		05-E	106JB
48	-	-	199351							1		05-E	106JB
48	-	-	199352							1		05-E	106JB
48	5	-	501C2-3							2		29	106JB
48	15	-	501C4-4							4		29	106JB
48	16	-	AN935-4							4		29	128
48	21	-	649541							1		05-E	106JB
48	-	-	649546							1		05-E	106JB
48	22	-	649530							1		05-E	106JB
48	23	-	R-2X1228U							2		29	106JB

FIG. NO.	INDEX NO.	STOCKED	GROUP Aircraft Instruments							UNITS PER ASSY	PROPERTY CLASSIFICATION						
			MAJOR ASSEMBLY		Turn Indicator Type C1 No. 657069-L						U.S. NAVY	U.S. ARMY	BRITISH				
			PART NUMBER	1	2	3	4	5	6					NOMENCLATURE			
	-																
48	24		199449								1			05-E			106JB
48	25		199452								2			05-E			106JB
48	26		804863								1			05-E			106JB
48	27		199454								1			05-E			106JB
48	28		199451								1			05-E			106JB
48	29		AN510C0-3								2			29			128
48	30		199448								1			05-E			106JB
48	31		804865								1			05-E			106JB
48	32		501C1-2								4			29			106JB
48	33		199453								1			05-E			106JB
48	34		804864								1			05-E			106JB
48	35		199450								1			05-E			106JB
48	29		AN510C0-3								2			29			128
48	36		199455								1			05-E			106JB
48	37		209925								2			05-E			106JB
48	8		501C2-4								4			29			106JB
48	9		AN935-2								4			29			128
48	-		649547								1			05-E			106JB
48	38		199477								1			05-E			106JB
48	39		199471								1			05-E			106JB
48	40		804874								1			05-E			106JB
48	41		199494								6			05-E			106JB
48	42		199472								2			05-E			106JB
48	43		199493								2			05-E			106JB
48	44		199474								1			05-E			106JB
48	45		AN535-2-3								2			29			128
48	46		807101								1			05-E			106JB
48	-		649529								1			05-E			106JB
48	-		201127								1			05-E			106JB
48	47		500C8-10								4			29			106JB
48	48		AN935-8								4			29			128
48	49		199505								1			05-E			106JB
48	50		199504								1			05-E			106JB
48	51		199473								2			05-E			106JB
48	-		199518								1			05-E			106JB
48	52		199506								1			05-E			106JB
48	53		199659								1			05-E			106JB
48	54		199529								1			05-E			106JB
48	-		199517								1			05-E			106JB
48	55		199509								1			05-E			106JB
48	56										1			05-E			106JB
48	57		199510								1			05-E			106JB
48	58		199530								1						
48	59		199507								1			05-E			106JB
48	60		199508								1			05-E			106JB
48	61		199511								1			05-E			106JB
48	62		199591								1			05-E			106JB
48	-		199519								1			05-E			106JB
48	63		199512								1			05-E			106JB
48	64		199503								1			05-E			106JB
48	65		199515								1			05-E			106JB
48	66										1			05-E			106JB

SECTION IX — GROUP ASSEMBLY PARTS LISTS

FIG. NO.	INDEX NO.	SYMBOL	GROUP Aircraft Instruments							UNITS PER ASSY	PROPERTY CLASSIFICATION		
			MAJOR ASSEMBLY Turn Indicator Type C1 No. 657069-L								U.S. NAVY	U.S. ARMY	BRITISH
			PART NUMBER	1	2	3	4	5	6				
49	-	-	199348							1		05-E	106JB
49	-	-	199349							1		05-E	106JB
49	-	-	199347							1		05-E	106JB
49	8	-	50102-4							4		29	106JB
49	-	-	199389							1		05-E	106JB
49	82	-	199386							2		05-E	106JB
49	-	-	199384							2		05-E	106JB
49	83	-	199388							2		05-E	106JB
49	84	-	199387							2		05-E	106JB
49	85	-	50100-2							2		29	106JB
49	8	-	50102-4							2		29	106JB
49	86	-	186026							2		05-E	106JB
49	9	-	AN935-2							2		29	128
49	87	-	209522							1		05-E	106JB
49	88	-	209541							1		05-E	106JB
49	89	-	209542							1		05-E	106JB
49	90	-	199292							2		05-E	106JB
49	-	-	199294							1		05-E	106JB
49	-	-	199290							1		05-E	106JB
49	-	-	199289							1		05-E	106JB
49	-	-	199293							1		05-E	106JB
49	5	-	50102-3							6		29	106JB
49	9	-	AN935-2							6		29	128
			VERTICAL RING AND TORQUE MOTOR ASSY										
	-	-	79012-C							1		05-E	106JB
	-	-	79010							1		05-E	106JB
50	91	-	649532							1		05-E	106JB
50	92	-	804844							1		05-E	106JB
50	93	-	195471							4		05-E	106JB
50	94	-	199362							2		05-E	106JB
50	95	-	199361							2		05-E	106JB
50	96	-	0188-3							2		05-E	106JB
50	9	-	AN935-2							2		29	128
50	5	-	50102-3							2		29	106JB
50	97	-	199364							1		05-E	106JB
50	98	-	199368							1		05-E	106JB
50	99	-	199432							1		05-E	106JB
50	100	-	199434							2		05-E	106JB
50	101	-	199367							1		05-E	106JB
50	5	-	50102-3							1		29	106JB
50	9	-	AN935-2							2		29	128
50	-	-	199323							2		05-E	106JB
50	102	-	199319							1		05-E	106JB
50	103	-	199318							1		05-E	106JB

VERTICAL RING AND TORQUE MOTOR ASSY NO.79012-C

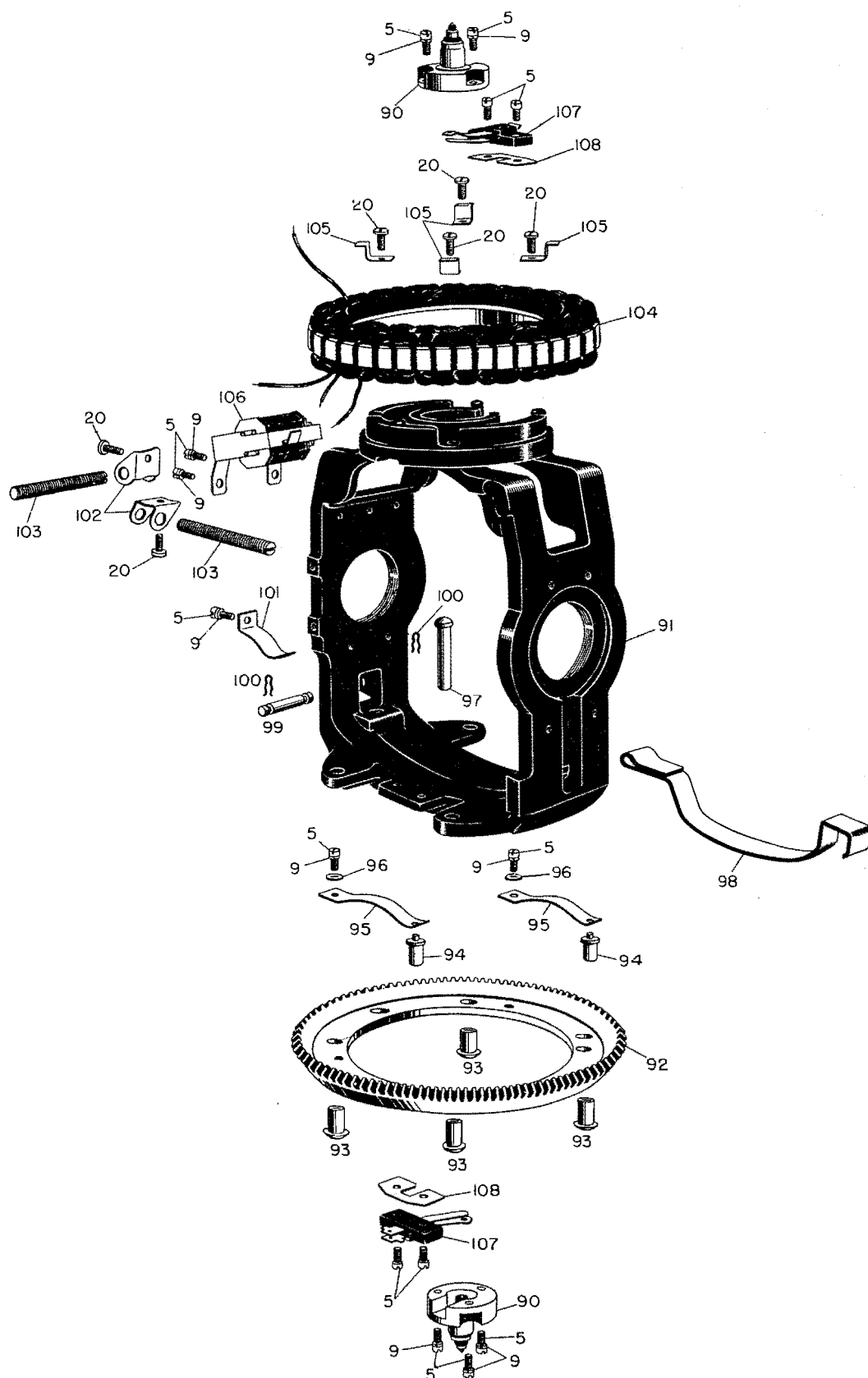


Figure 50

SECTION IX—GROUP ASSEMBLY PARTS LISTS

FIG. NO.	INDEX NO.	STOCKED	GROUP Aircraft Instruments							UNITS PER ASSY	PROPERTY CLASSIFICATION		
			MAJOR ASSEMBLY Turn Indicator Type Cl No. 657069-L								U.S. NAVY	U.S. ARMY	BRITISH
			PART NUMBER	1	2	3	4	5	6				
50	-								Ring Assy - Vertical (Cont'd.)				
50	20		193159						Screw	1		05-E	106JB
50	104		649550						Stator Assy - Torque Motor	1		05-E	106JB
50	-		804852						Stacking Assy - Stator	1		05-E	106JB
50	-		804850						Lamination	13		05-E	106JB
50	-		804851						Insulator	2		05-E	106JB
50	-								Lining (.005 in.x1/4 in.x1 in Varn. Cambric)	40		05-E	106JB
50	-								Fishpaper (.015 in.x1/8 in. x1/4 in.)	40		05-E	106JB
50	-		P69843						Cable (No. 38 Awg (Green) 1-1/2 ounces)	1		05-E	106JB
50	-		P690120						Cable (No. 27 Awg (Black) 4 in. long)	1		05-E	106JB
50	-		P690120						Cable (No. 27 Awg (White) 4 in. long)	1		05-E	106JB
50	-		P690120						Cable (No. 27 Awg (Green) 4 in. long)	1		05-E	106JB
50	-		P690120						Cable (No. 27 Awg (Yellow) 4 in. long)	1		05-E	106JB
50	105		199270						Clamp - Stator	4		05-E	106JB
50	20		193159						Screw	4		05-E	106JB
50	106		649551						Transformer Assy - Control	1		05-E	106JB
50	-		199440						Plate - Terminal	1		05-E	106JB
50	-		199441						Bracket	1		05-E	106JB
50	-		201221						Lamination & Winding Assy	1		05-E	106JB
50	-		199436						Winding Assy	1		05-E	106JB
50	-		199433						Lamination	50		05-E	106JB
50	5		501C2-3						Screw - Fillister Head, .086 in.-64x3/16 in.	2		29	106JB
50	9		AN935-2						Washer - Lock (For .086 in. Screw)	2		29	128
50	107		199315						Contact Assy	2		05-E	106JB
50	-								Each Consisting of:				
50	-		199316						Contact	1		05-E	106JB
50	-		199317						Contact	1		05-E	106JB
50	108		199280						Insulator	1		05-E	106JB
50	5		501C2-3						Screw - Fillister Head, .086 in.-64x3/16 in.	2		29	106JB
50	90		199292						Contact Assy - Flange	2		05-E	106JB
50	-								Each Consisting of:				
50	-		199294						Flange	1		05-E	106JB
50	-		199290						Contact Assy	1		05-E	106JB
50	-		199289						Sleeve	1		05-E	106JB
50	-		199293						Rod	1		05-E	106JB
50	5		501C2-3						Screw - Fillister Head, .086 in.-64x3/16 in.	6		29	106JB
50	9		AN935-2						Washer - Lock (For .086 in. Screw)	6		29	128
									GYRO UNIT ASSY				
51	AA		649549-D						Gyro Unit Assy	1		05-E	106JB
51	109		649548-C						Rotor Unit Assy	1		05-E	106JB
51	-		199355						Stator Assy	1		05-E	106JB
51	-		199281						Shaft Assy	1		05-E	106JB
51	-		199372						Lamination & Winding Assy	1		05-E	106JB
51	-								Fishpaper (.010 in. x 11/32 in. x 29/32 in.)	12		05-E	106JB

GYRO UNIT ASSY NO.649549-D

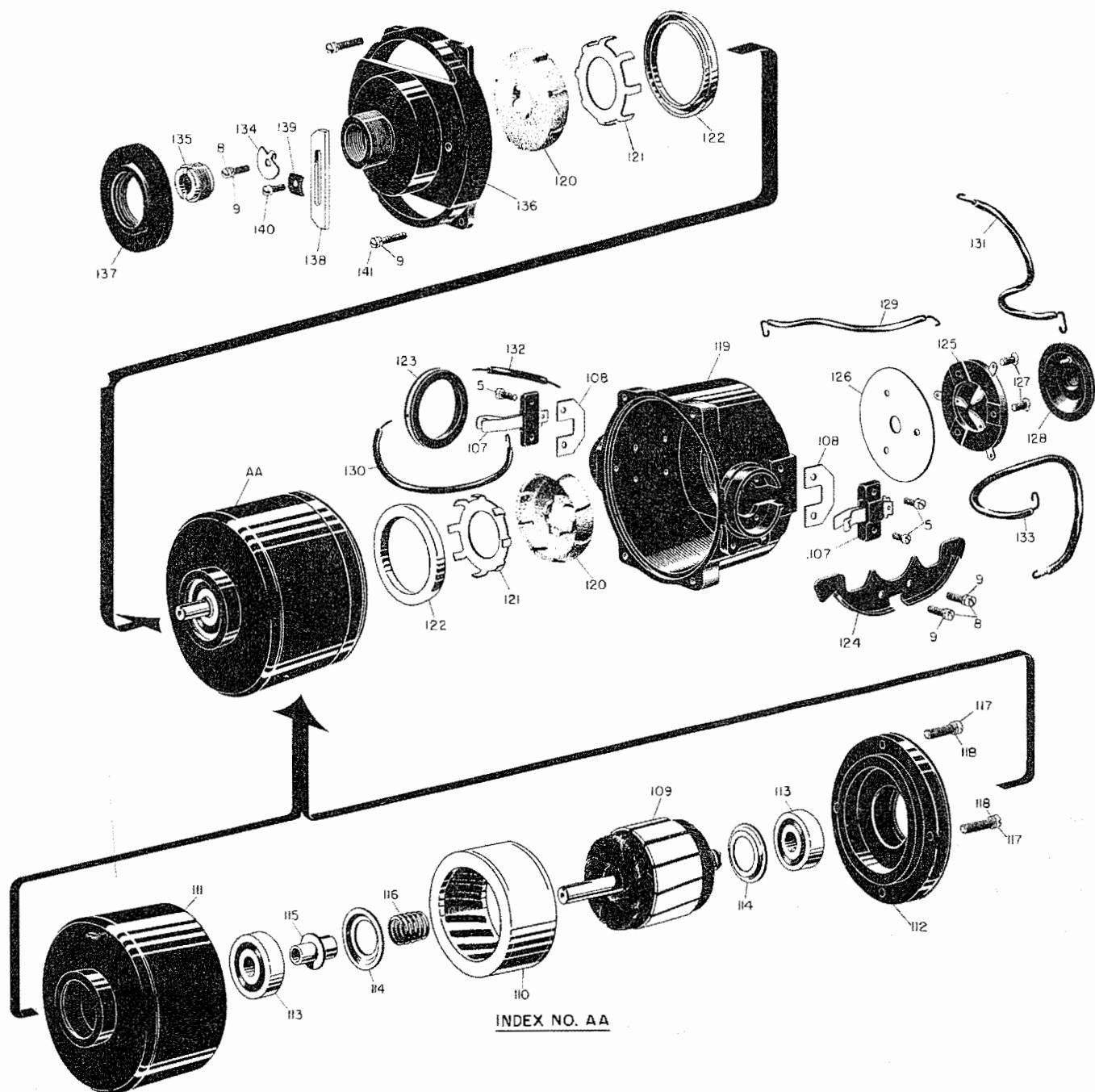


Figure 51

SECTION IX—GROUP ASSEMBLY PARTS LISTS

FIG. NO.	INDEX NO.	STOCKED	GROUP Aircraft Instruments							UNITS PER ASSY	PROPERTY CLASSIFICATION				
			MAJOR ASSEMBLY Turn Indicator Type C1 No. 657069-L								U.S. NAVY	U.S. ARMY	BRITISH		
			PART NUMBER	1	2	3	4	5	6					NOMENCLATURE	
51	-	-	162006							Lamination & Winding Assy (Cont'd.)	50			All parts are in class 106JB unless otherwise noted.	
51	-	-	162007							Lamination Insulator	2		05-E		
51	-	-								Tubing (No. 24 Varnished Cambric 3/8 in. long)	7		05-E		
51	-	-								Lead (No. 30 Awg Double Cotton Covered 3 in. long)	3		05-E		
51	-	-	199282							Shaft	1		05-E		
51	-	-	199277							Insulator & Pin Assy	1		05-E		
51	-	-	199276							Insulator	1		05-E		
51	-	-								Pin (No. 21 (.032 in.) x3/4 in. Br. Esc.	3		05-E		
51	-	-								Tubing (No. 24 (.020 in.) Varn. Cambric 11/16 in. long)	3		05-E		
51	110	-	199278							Cage Assy - Rotor Squirrel (Mach. Cstg.)	1		05-E		
51	-	-	162012							Lamination	42		05-E		
51	-	-	162056							Lamination	4		05-E		
51	111	-	804756							Rotor	1		05-E		
51	112	-	804757							Cap - Bearing	1		05-E		
51	113	-	SP-36							Bearing - Ball (New Departmenture) (Sperry Part No. 170934)	2		29		
51	114	-	199279							Washer	2		05-E		
51	115	-	199283							Bushing	1		05-E		
51	116	-	162009							Spring	1		05-E		
51	117	-	501C3-6							Screw - Fillister Head, .099 in.-56x3/8 in.	4		29		
51	118	-								Washer - Lock (For .099 in. Screw)	4		05-E		
51	8	-	501C2-4							Screw - Fillister Head, .086 in.-64x1/4 in.	1		29		
51	9	-	AN935-2							Washer - Lock (For .086 in. Screw)	1		29		128
51	-	-	79007							Case Assy	1		05-E		
51	119	-	78999							Case - Mach. Cstg.	1		05-E		
51	120	-	199295							Pad - Oil	1		05-E		
51	121	-	199378							Retainer - Oil Pad	1		05-E		
51	122	-	199379							Cap - Oil Pad	1		05-E		
51	107	-	199315							Contact Assy	2		05-E		
51	-	-								Each Consisting of:					
51	-	-	199316							Contact	1		05-E		
51	-	-	199317							Contact	1		05-E		
51	108	-	199280							Insulator	2		05-E		
51	5	-	501C2-3							Screw - Fillister Head, .086 in.-64x3/16 in.	4		29		
51	123	-	199381							Switch Assy - Leveling	1		05-E		
51	-	-	19							Segment - Switch (H. A. Wilson & Co. (Sperry Part No. 199382))	1		08-B		
51	124	-	199369							Cam	1		05-E		
51	8	-	501C2-4							Screw - Fillister Head, .086 in.-64x1/4 in.	2		29		
51	9	-	AN935-2							Washer - Lock (For .086 in. Screw)	2		29	128	

All parts are in class 106JB unless otherwise noted.

SECTION IX—GROUP ASSEMBLY PARTS LISTS

FIG. NO.	INDEX NO.	STOCKED	GROUP Aircraft Instruments							UNITS PER ASSY	PROPERTY CLASSIFICATION		
			MAJOR ASSEMBLY Turn Indicator Type C1 No. 657069-L								U.S. NAVY	U.S. ARMY	BRITISH
			PART NUMBER	1	2	3	4	5	6				
51	-								Case Assy (Cont'd.)	1			128
51	125		199380						Contact Assy	3	05-E		
51	-		199366						Contact	1	05-E		
51	-		199393						Stud	1	05-E		
51	126		199314						Insulator	1	05-E		
51	127		AN51062-3						Screw - Flathead, .086 in.-64x3/16 in.	3	29		
51	128		S-1004						Weight Assy - Compensator (Elastic Stop Nut Corp.) (Sperry Part No. 199383)	1	04-A		
51	-		804847						Weight	1	05-E		
51	-		199385						Screw	1	05-E		
51	129		209395						Lead, No. 24 Awg (Red) 1-3/4 in. long	1	05-E		
51	130		209392						Lead, No. 24 Awg (Blue) 2-1/2 in. long	1	05-E		
51	131		209394						Lead, No. 24 Awg (Yellow) 2-1/4 in. long	1	05-E		
51	132		209393						Lead, No. 24 Awg (Red) 1 in. long	1	05-E		
51	133		209396						Lead, No. 24 Awg (Green) 2-1/4 in. long	1	05-E		
51	-		804825						Housing Assy	1	05-E		
51	134		199288						Washer - Locating	1	05-E		
51	135		199291						Ring	1	05-E		
51	136		79000						Housing, Mach. Cstg.	1	05-E		
51*	120		199295						Pad - Oil	1	05-E		
51	121		199378						Retainer - Oil Pad	1	05-E		
51	122		199379						Cap - Oil Pad	1	05-E		
51	137		S-1003						Weight Assy - Balance (Elastic Stop Nut Corp.) (Sperry Part No. 199320)	1	04-A		
51	-		199321						Weight	1	05-E		
51	138		199353						Weight - Balance	1	05-E		
51	139		199354						Washer	1	05-E		
51	140								Screw - Fillister Head, .086 in.-64x5/32 in. Corrosive Resistant Steel	1	29		
51	141		50102-6						Screw - Fillister Head, .086 in.-64x3/8 in.	4	05-E		
51	9		AN935-2						Washer - Lock (For .086 in. Screw)	4	29	128	

All parts are in class 106JB unless otherwise noted.

SECTION IX—GROUP ASSEMBLY PARTS LISTS

FIG. NO.	INDEX NO.	STOCKED	GROUP AIRCRAFT INSTRUMENTS							UNITS PER ASSY	PROPERTY CLASSIFICATION				
			MAJOR ASSEMBLY DIRECTIONAL GYRO INDICATOR, TYPE C1								U.S. NAVY	U.S. ARMY	BRITISH		
			PART NUMBER	1	2	3	4	5	6	NOMENCLATURE					
52	39		701246												
52	40		199363								1				106JA
52	41		804843								2				106JA
52	42		199292								2				106JA
52			*199294								1				106JA
52			*199290								1				106JA
52			*199289								1				106JA
52			*199293								1				106JA
52	43		AN501C2-3								6				128
52	15		AN935-2								6				128
52	44		232890								2				106JA
52	45		234264								1				106JA
52			*199365								1				106JA
52			*248315								1				106JA
52			*199349								1				106JA
52			*248316								1				106JA
52			*248317								1				106JA
52			*199347								1				106JA
52	46		234263								1				106JA
52			*199365								1				106JA
52			*248315								1				106JA
52			*199349								1				106JA
52			*248316								1				106JA
52			*248317								1				106JA
52			*199347								1				106JA
52	43		AN501C2-3								4				128
52			209795								1				106JA

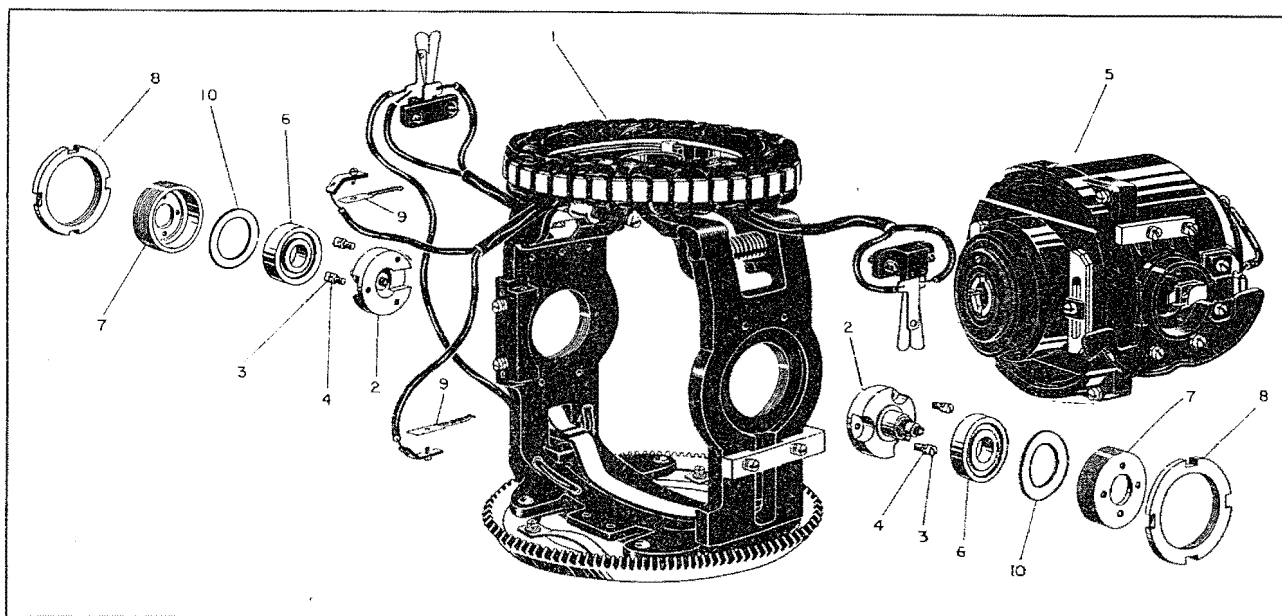


Figure 53 - Vertical Gyro and Gimbal Assy

SECTION IX--GROUP ASSEMBLY PARTS LISTS

FIG. NO.	INDEX NO.	STOCKED	GROUP AIRCRAFT INSTRUMENTS							UNITS PER ASSY	PROPERTY CLASSIFICATION						
			MAJOR ASSEMBLY		DIRECTIONAL GYRO INDICATOR, TYPE C1						U.S. NAVY	U.S. ARMY	BRITISH				
			PART NUMBER	1	2	3	4	5	6					NOMENCLATURE			

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SECTION IX-GROUP ASSEMBLY PARTS LISTS

FIG. NO.	INDEX NO.	STOCKED	GROUP AIRCRAFT INSTRUMENTS							UNITS PER ASSY	PROPERTY CLASSIFICATION			
			MAJOR ASSEMBLY DIRECTIONAL GYRO INDICATOR, TYPE C1								U.S. NAVY	U.S. ARMY	BRITISH	
			PART NUMBER	1	2	3	4	5	6					NOMENCLATURE
54	9		199280							Insulator	2			106JA
54	6		AN501C2-3							Screw - Fil-hd.	4			128
54	10		210361							Contact Assy	1			106JA
54			*199315							Contact Assy	1			106JA
54			*199316							Contact	1			106JA
54			*199317							Contact	1			106JA
54			*comm							Tubing - Flex. plastic, No. 10, .106 x 7/16 in. long, type GP, black	1			105F
54	11		210366							Clamp	1			106JA
54	12		210367							Counterweight	1			106JA
54	13		AN501C2-5							Screw - Fil-hd	2			128
54	7		AN935-2							Washer - Med spring lock	2			128

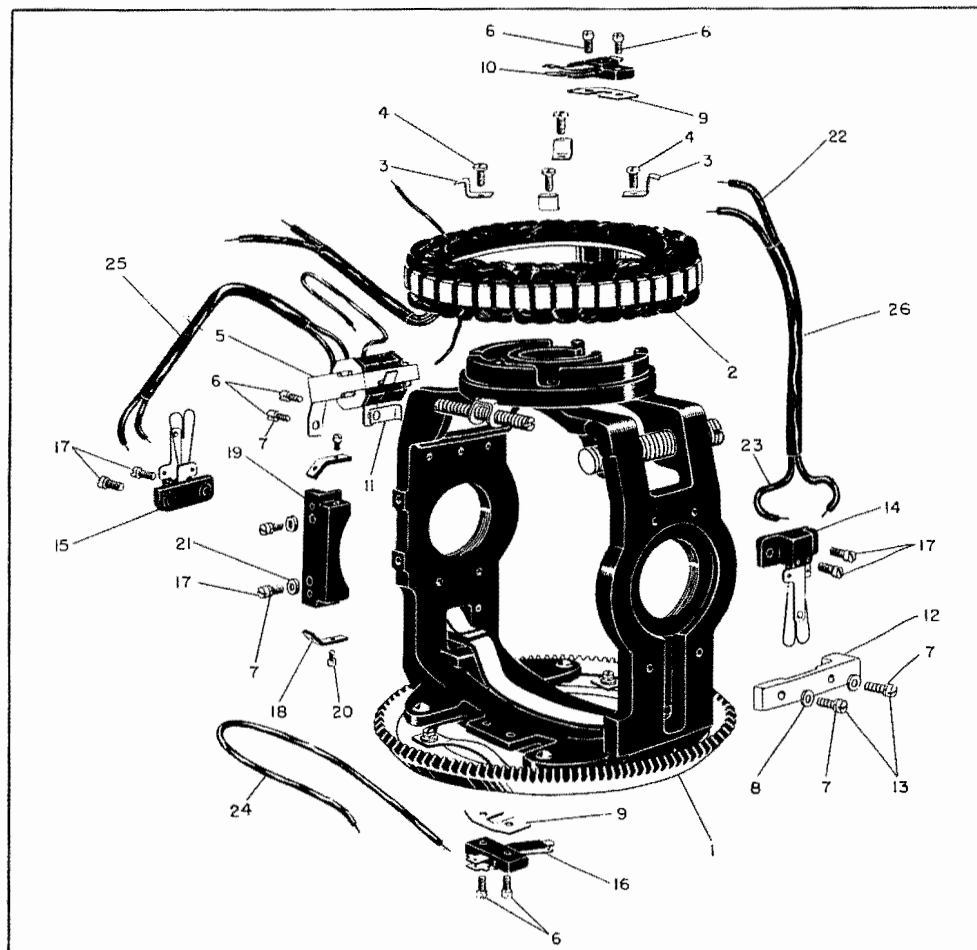


Figure 54 - Vertical Ring and Motor Assy

SECTION IX—GROUP ASSEMBLY PARTS LISTS

FIG. NO.	INDEX NO.	STOCKED	GROUP AIRCRAFT INSTRUMENTS								UNITS PER ASSY	PROPERTY CLASSIFICATION		
			MAJOR ASSEMBLY DIRECTIONAL GYRO INDICATOR, TYPE C1									U.S. NAVY	U.S. ARMY	BRITISH
			PART NUMBER	1	2	3	4	5	6	NOMENCLATURE				
54	14		234263						Contact Assy	1			106JA	
54			*199365						Contact Assy	1			106JA	
54			*248315						Contact Assy	1			106JA	
54			*199349						Spring	1			106JA	
54			*248316						Support	1			106JA	
54			*248317						Contact - Flex.	1			106JA	
54			*199347						Contact	1			106JA	
54	15		234262						Contact Assy	1			106JA	
54			*199365						Contact Assy	1			106JA	
54			*248315						Contact Assy	1			106JA	
54			*199349						Spring	1			106JA	
54			*248316						Support	1			106JA	
54			*248317						Contact - Flex.	1			106JA	
54			*199347						Contact	1			106JA	
54	16		234300						Contact Assy	1			106JA	
54			*199315						Contact Assy	1			106JA	
54			*199316						Contact	1			106JA	
54			*199317						Contact	1			106JA	
54			*comm						Tubing - Flex. plastic, No. 10, .106 x 7/16 in. long, type GP, black	1			105F	
54	17		AN501C2-4						Screw - Fil-hd	4			128	
54	18		199387						Terminal	2			106JA	
54	19		199386						Holder Assy - Brush	1			106JA	
54			*199384						Insert	2			106JA	
54	20		AN501C0-2						Screw - Fil-hd	2			128	
54	17		AN501C2-4						Screw - Fil-hd	2			128	
54	21		186026						Washer	2			106JA	
54	7		AN935-2						Washer - Med spring lock	2			128	
54	22		P690138						Cable - No. 24 AWG, green, 4 in. long	1			106JA	
54	23		P690138						Cable - No. 24 AWG, yellow, 4 in. long	1			106JA	
54	24		P690138						Cable - No. 24 AWG, red, 5 in. long	1			106JA	
54	25		comm						Tubing - No. 11, .095 x 1-7/8 in. long, XTE-130, Irv-o-lite, black	1			105F	
54	26		comm						Tubing - No. 10, 1-3/4 in. long, XTE-130, Irv-o-lite, black	1			105F	
VERTICAL RING ASSY														
54	1		79010						Ring Assy - Vertical	1			106JA	
55	1		649532						Ring - Vertical	1			106JA	
55	2		804844						Gear (48-pitch - 156-teeth)	1			106JA	
55	3		S3129						Rivet (JLT)(No. 210700)	4			106JA	
55	4		199362						Shoe - Brake	2			106JA	
55	5		199361						Spring	2			106JA	
55	6		AN960C2						Washer	2			128	
55	7		AN935-2						Washer - Med spring lock	2			128	

SECTION IX-GROUP ASSEMBLY PARTS LISTS

FIG. NO.	INDEX NO.	STOCKED	GROUP AIRCRAFT INSTRUMENTS							UNITS PER ASSY	PROPERTY CLASSIFICATION		
			MAJOR ASSEMBLY DIRECTIONAL GYRO INDICATOR, TYPE C1								U.S. NAVY	U.S. ARMY	BRITISH
			PART NUMBER	1	2	3	4	5	6	NOMENCLATURE			
55	8		AN501C2-3						Screw - Fil-hd	2			128
55	9		211542						Spring - Retaining	1			106JA
55	10		211543						Screw - Balancing	1			106JA
55	11		232210						Plunger	1			106JA
55	12		232211						Shoe - Adj	1			106JA
55	13		comm						Nut - Hex, .099 in. - 56 corrosion resistant steel	1			106JA
55	14		199368						Spring - Leaf	1			106JA
55	15		199432						Pin - Pivot	1			106JA
55	16		199434						Clip - Spring	2			106JA
55	17		199367						Spring	1			106JA
55	8		AN501C2-3						Screw - Fil-hd	1			128
55	7		AN935-2						Washer - Med spring lock	1			128
55	18		199323						Screw Assy - Balance	2			106JA
55	19		199319						Bracket	1			106JA
55	20		199318						Screw	1			106JA
55	21		193159						Screw	2			106JA

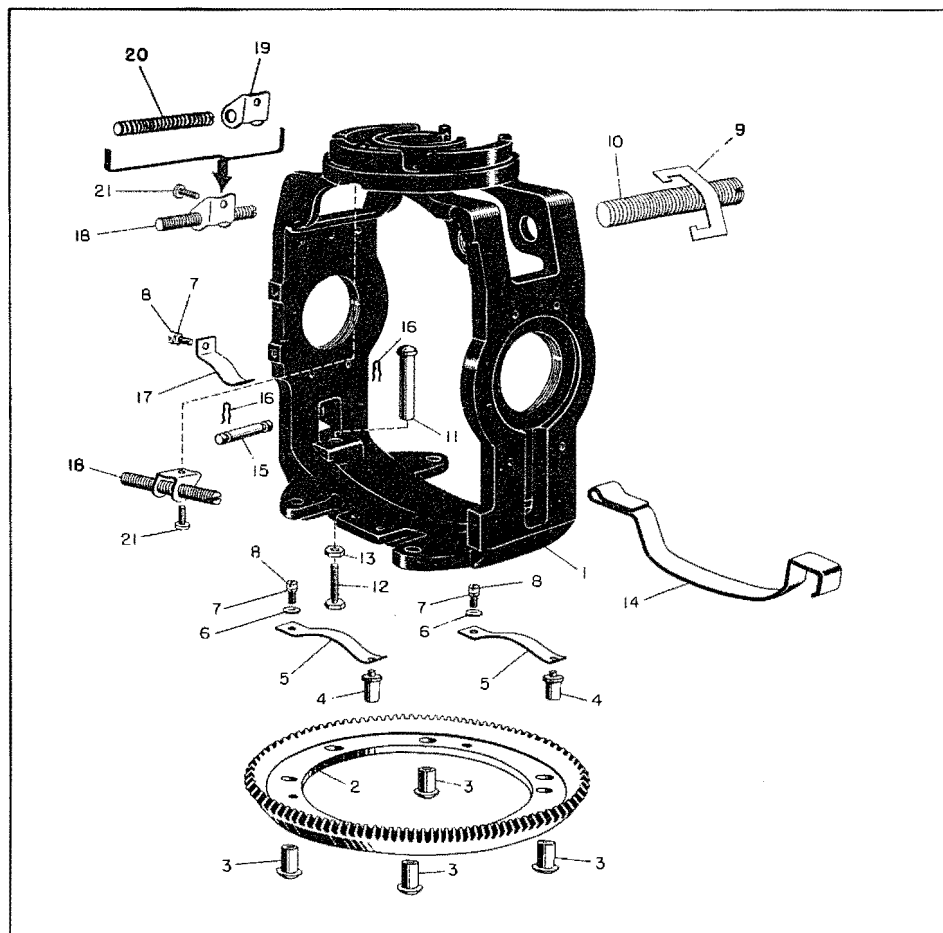


Figure 55 - Vertical Ring Assy

This diagram shows an exploded view of a mechanical assembly. The components are labeled with numbers 1 through 6. Part 1 is a central cylindrical component. Part 2 is a small circular plate. Part 3 is a small cylindrical pin or bolt. Part 4 is a large, complex housing or bracket. Part 5 is a curved, semi-circular component. Part 6 is a small rectangular plate. The diagram illustrates how these parts fit together to form the complete assembly.

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SECTION IX—GROUP ASSEMBLY PARTS LISTS

FIG. NO.	INDEX NO.	STOCKED	GROUP AIRCRAFT INSTRUMENTS							UNITS PER ASSY	PROPERTY CLASSIFICATION		
			MAJOR ASSEMBLY DIRECTIONAL GYRO INDICATOR, TYPE C1								U.S. NAVY	U.S. ARMY	BRITISH
			PART NUMBER	1	2	3	4	5	6				
56			*804756						Body - Rotor	1			106JA
56			*804757						Cap - Rotor	1			106JA
56			*170934						Bearing - Ball	2			106JA
56			*232115						Washer	1			106JA
56			*162009						Spring	1			106JA
56			AN501C3-6						Screw - Fil-hd	4			128
56			AN935-3						Washer - Med spring lock	4			128
56	2		AN501C2-4						Screw - Fil-hd	1			128
56	3		AN935-2						Washer - Med spring lock	1			128
56	4		79007						Case Assy (see figure 57 for breakdown)	1			106JA
56	5		804825						Housing Assy (see figure 58 for breakdown)	1			106JA
56	6		AN501C2-6						Screw - Fil-hd	4			128
56	3		AN935-2						Washer - Med spring lock	4			128
									CASE ASSY				
56	4		79007						Case Assy	1			106JA
57	1		78999						Case	1			106JA
57	2		199295						Pad - Oil	1			106JA
57	3		199379						Cap - Oil pad	1			106JA
57	4		210361						Contact Assy	1			106JA
57			*199315						Contact Assy	1			106JA
57			*199316						Contact	1			106JA
57			*199317						Contact	1			106JA
57			*comm						Tubing - No. 10, .106 x 7/16 in. long, XTE-130, Irv-o-lite, black	1			105F

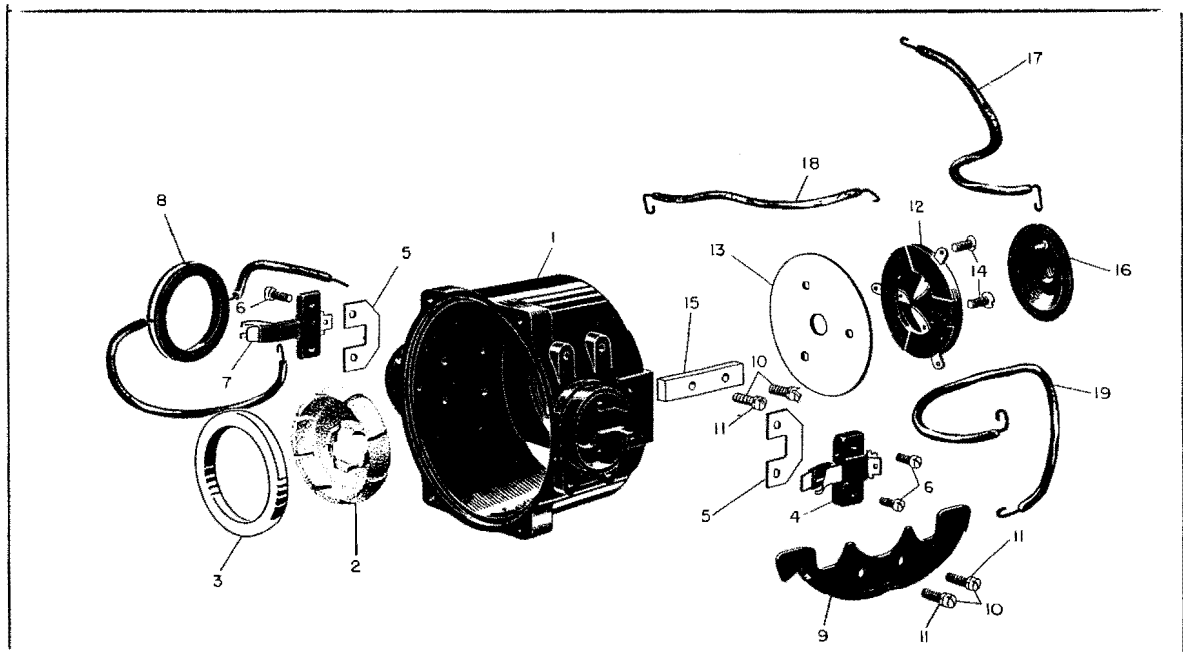


Figure 57 - Case Assy

SECTION IX-GROUP ASSEMBLY PARTS LISTS

FIG. NO.	INDEX NO.	STOCKED	GROUP AIRCRAFT INSTRUMENTS							UNITS PER ASSY	PROPERTY CLASSIFICATION		
			MAJOR ASSEMBLY DIRECTIONAL GYRO INDICATOR, TYPE C1								U.S. NAVY	U.S. ARMY	BRITISH
			PART NUMBER	1	2	3	4	5	6				
57	5		199280						Insulator	2		106JA	
57	6		AN501C2-3						Screw - Fil-hd	4		128	
57	7		234303						Contact Assy	1		106JA	
57			*199315						Contact Assy	1		106JA	
57			*199316						Contact	1		106JA	
57			*199317						Contact	1		106JA	
57			*comm						Tubing - Flex. plastic, No. 10, .106 x 7/16 in. long, type GP, black	1		105F	
57	8		210362						Switch & Lead Assy - Leveling	1		106JA	
57			*199381						Switch Assy	1		106JA	
57			*199382						Segment - Switch	1		106JA	
57			*P690138						Cable - No. 24 AWG, blue, 2-1/8 in. long	1		106JA	
57			*P690138						Cable - No. 24 AWG, red, 1/2 in. long	1		106JA	
57	9		199369						Cam	1		106JA	
57	10		AN501C2-4						Screw - Fil-hd	2		128	
57	11		AN935-2						Washer - Med spring lock	2		128	
57	12		199380						Contact Assy	1		106JA	
57			*199386						Contact	3		106JA	
57			*199393						Stud	1		106JA	
57	13		199314						Insulator	1		106JA	
57	14		AN510C2-3						Screw - FH	3		128	
57	15		210363						Counterweight	1		106JA	
57	10		AN501C2-4						Screw - Fil-hd	2		128	
57	11		AN935-2						Washer - Med spring lock	2		128	
57	16		199383						Weight Assy - Compensator	1		106JA	
57			*211064						Weight Assy - Lock ring	1		106JA	
57			*804847						Weight	1		106JA	
57			199385						Stop - Screw	1		106JA	
57	17		P690138						Cable - No. 24 AWG, yellow, 2-1/4 in. long	1		106JA	
57	18		P690138						Cable - No. 24 AWG, red, 1-3/4 in. long	1		106JA	
57	19		P690138						Cable - No. 24 AWG, green, 2-1/4 in. long	1		106JA	

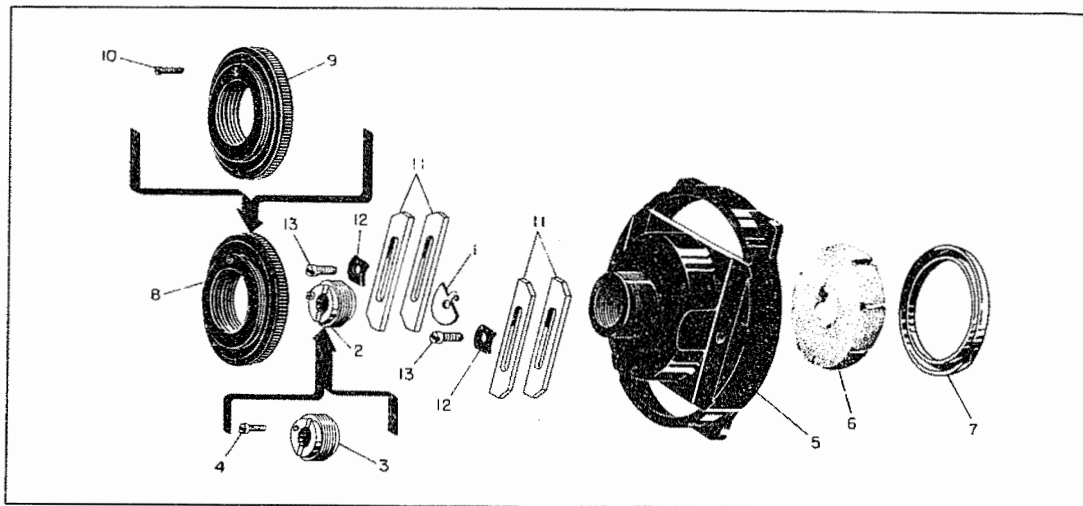


Figure 58 - Housing Cover Assy

FIG. NO.	INDEX NO.	STOCKED	GROUP AIRCRAFT INSTRUMENTS								UNITS PER ASSY	PROPERTY CLASSIFICATION		
			MAJOR ASSEMBLY DIRECTIONAL GYRO INDICATOR, TYPE C1									U.S. NAVY	U.S. ARMY	BRITISH
			PART NUMBER	1	2	3	4	5	6	NOMENCLATURE				
									HOUSING COVER ASSY					
56	5		804825						Cover Assy - Housing	1			106JA	
58	1		199288						Washer - Key	1			106JA	
58	2		211509						Nut Assy - Lock, adj	1			106JA	
58	3		199291						Nut	1			106JA	
58	4		AN501C0-4						Screw - Fil-hd	1			128	
58	5		79000						Cover - Housing	1			106JA	
58	6		199295						Pad - Oil	1			106JA	
58	7		199379						Cap - Oil pad	1			106JA	
58	8		210368						Nut Assy - Balance	1			106JA	
58	9		210369						Nut	1			106JA	
58	10		AN510C0-3						Screw - FH	1			128	
58	11		199353						Weight - Balance	4			106JA	
58	12		199354						Washer	2			106JA	
58	13		comm						Screw - Fil-hd, .086 - 64 x 7/32 in. corrosion resistant steel	2			106JA	

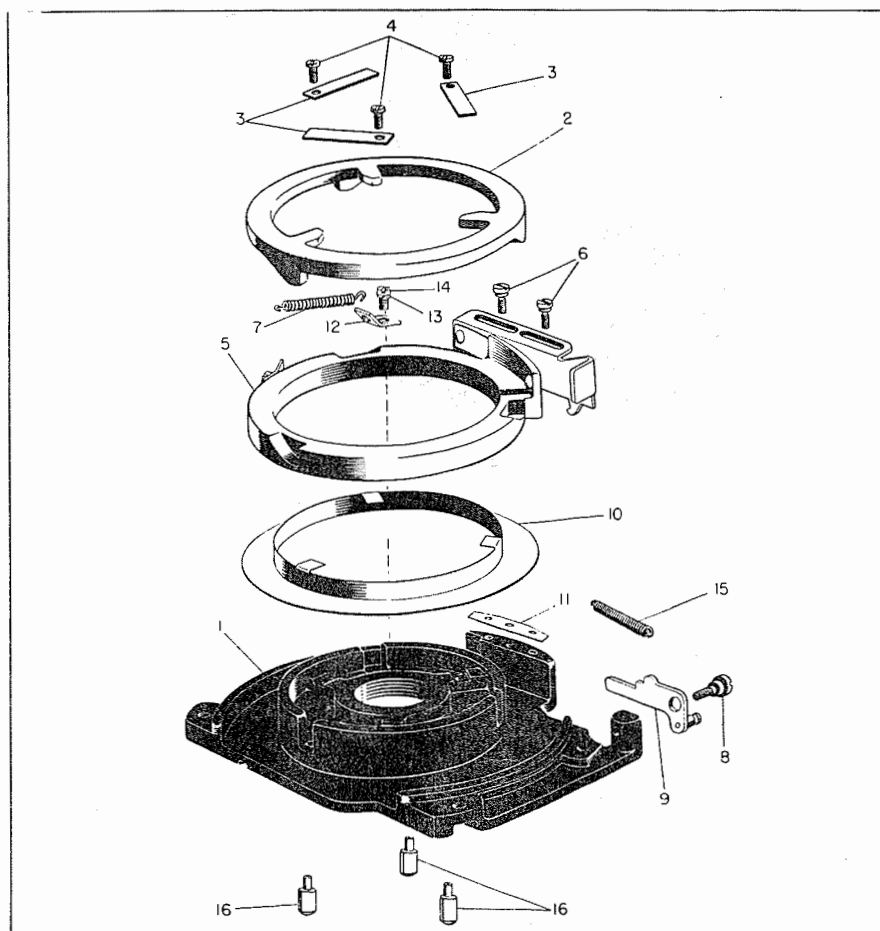


Figure 59 - Bottom Bracket Assy

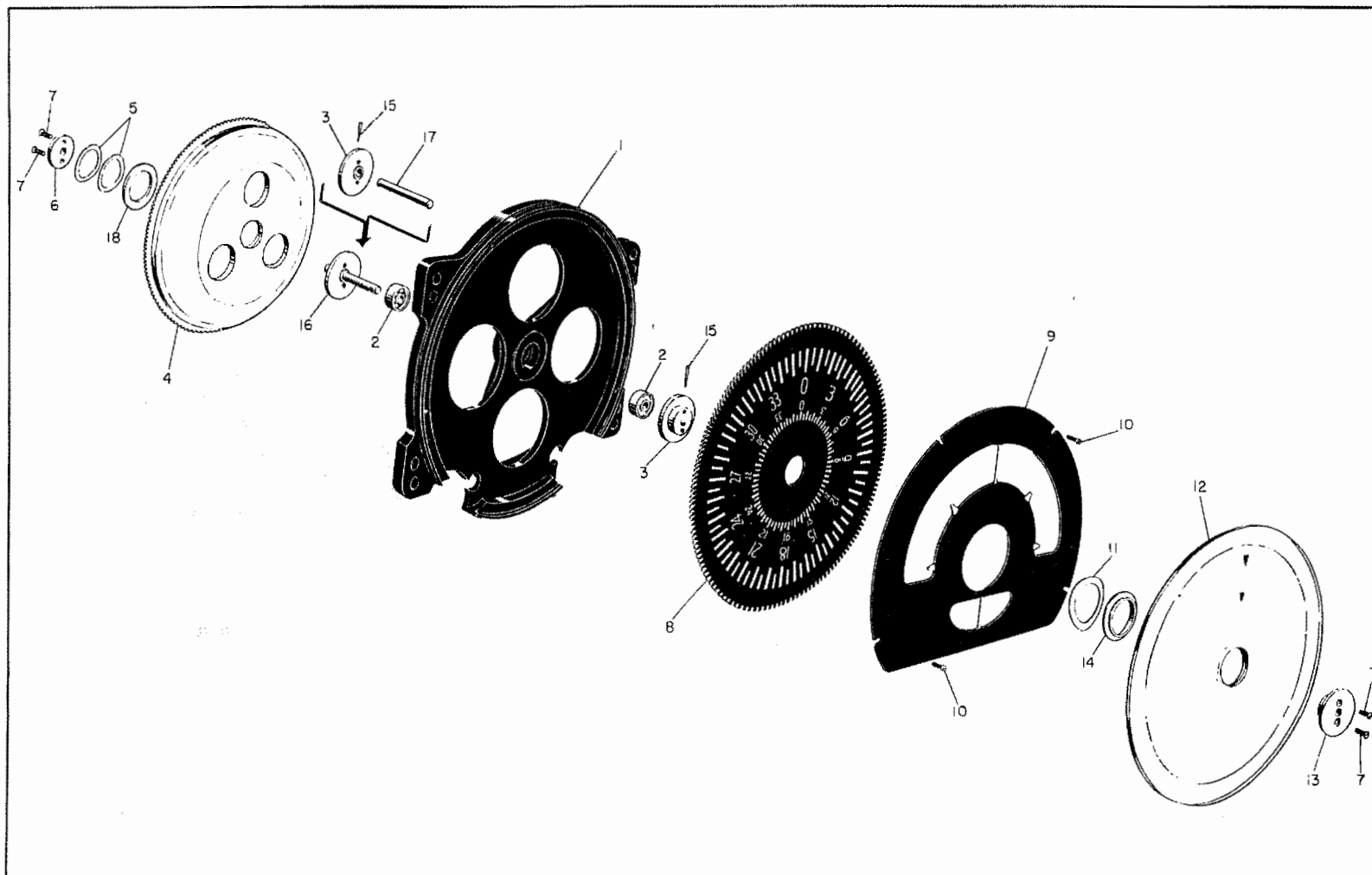


Figure 60 - Dial Assy

FIG. NO.	INDEX NO.	STOCKED	GROUP AIRCRAFT INSTRUMENTS							UNITS PER ASSY	PROPERTY CLASSIFICATION			
			MAJOR ASSEMBLY DIRECTIONAL GYRO INDICATOR, TYPE C1								U.S. NAVY	U.S. ARMY	BRITISH	
			PART NUMBER	1	2	3	4	5	6					NOMENCLATURE

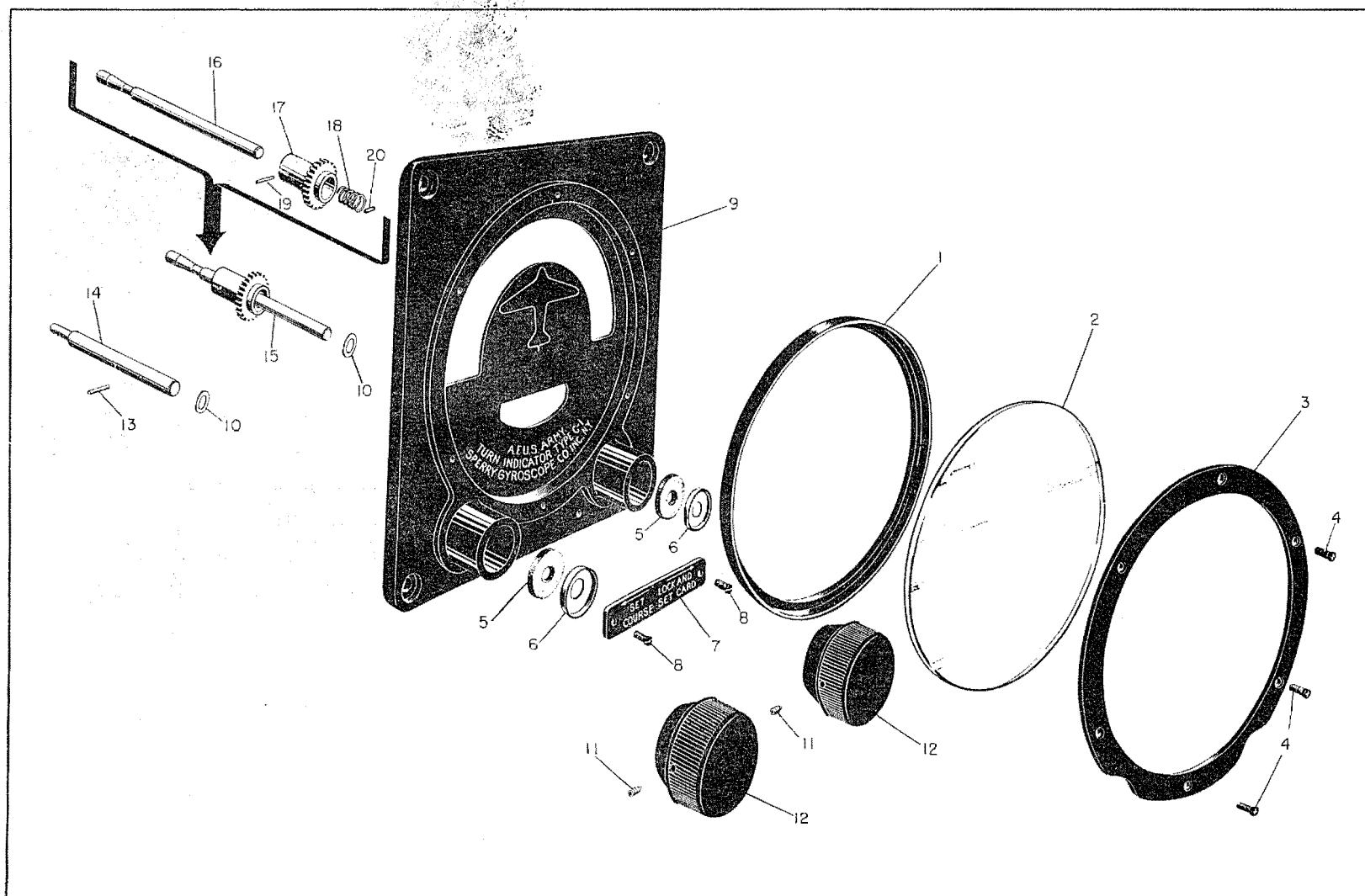


Figure 61 - Front Panel Assy

SECTION IX—GROUP ASSEMBLY PARTS LISTS

FIG. NO.	INDEX NO.	STOCKED	GROUP AIRCRAFT INSTRUMENTS								UNITS PER ASSY	PROPERTY CLASSIFICATION		
			MAJOR ASSEMBLY		DIRECTIONAL GYRO INDICATOR, TYPE C1							U.S. NAVY	U.S. ARMY	BRITISH
			PART NUMBER	1	2	3	4	5	6	NOMENCLATURE				
61	4		199494						Screw	6			106JA	
61	5		199472						Washer	2			106JA	
61	6		199493						Retainer	2			106JA	
61	7		199474						Plate - Instruction	1			106JA	
61	8		AN535-2-3						Screw - RH dr	2			128	
61	9		807101						Plate Assy - Panel & name	1			106JA	
61			*649529						Panel - Front	1			106JA	
61	10		224263						Washer	2			106JA	
61	11		196520						Screw	2			106JA	
61	12		199508						Knob	2			106JA	
61	13		Ref						Pin - .063 dia x 11/32 in. SS (Sperry spec No. 4243)	1			106JA	
61	14		199509						Shaft	1			106JA	
61	15		199519						Shaft Assy	1			106JA	
61	16		199512						Shaft	1			106JA	
61	17		199503						Gear - Pinion (48-pitch - 30-teeth)	1			106JA	
61	18		199515						Spring	1			106JA	
61	19		Ref						Pin - .063 dia x 13/32 in. SS (Sperry spec No. 4243)	1			106JA	
61	20		Ref						Pin - .063 dia x 19/64 in. SS (Sperry spec No. 4243)	1			106JA	
									BACK PLATE ASSY					
52	39		701246						Plate Assy - Back	1			106JA	
62	1		804877						Plate	1			106JA	
62	2		804878						Gasket	1			106JA	
62	3		AN3102-10S3P						Receptacle	1			105X	
62	4		P690138						Cable - No. 24 AWG, red, 5 in. long	1			106JA	
62	5		P690138						Cable - No. 24 AWG, yellow, 5-1/2 in. long	1			106JA	
62	6		P690138						Cable - No. 24 AWG, green, 5-1/2 in. long	1			106JA	
62	7		comm						Tubing - No. 11, .095 x 3/8 in. long XTE-130, Irv-o-lite, black	3			105F	

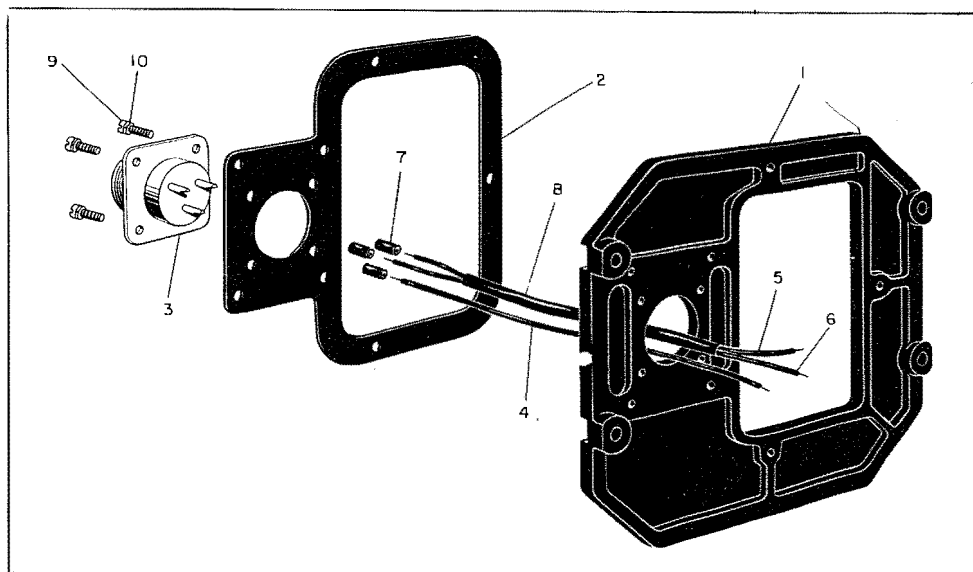


Figure 62 - Back Plate Assy

FIG. NO.	INDEX NO.	STOCKED	GROUP AIRCRAFT INSTRUMENTS							UNITS PER ASSY	PROPERTY CLASSIFICATION																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	
			MAJOR ASSEMBLY DIRECTIONAL GYRO INDICATOR, TYPE C1								U.S. NAVY	U.S. ARMY	BRITISH																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
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SECTION IX - GROUP ASSEMBLY PARTS LISTS

FIG. NO.	INDEX NO.	STOCKED	GROUP AIRCRAFT INSTRUMENTS							UNITS PER ASSY	PROPERTY CLASSIFICATION			
			MAJOR ASSEMBLY DIRECTIONAL GYRO INDICATOR, R88-I-1006								U.S. NAVY	U.S. ARMY	BRITISH	
			PART NUMBER	1	2	3	4	5	6					NOMENCLATURE
63	34		232890								2			
63	35		234264								1			
63			*199365								1			
63			*248315								1			
63			*199349								1			
63			*248316								1			
63			*248317								1			
63			*199347								1			
63	36		234263								1			
63			*199365								1			
63			*248315								1			
63			*199349								1			
63			*248316								1			
63			*248317								1			
63			*199347								1			
63	37		AN501C2-3								4			
63			0170-2								1			
VERTICAL GIMBAL AND GYRO ASSY														
63	2		659584								1			
64	1		79012											
64	2		199292								1			
64			*199294								2			
64			*199290								1			
64			*199289								1			
64			*199293								1			
64	3		AN501C2-3								6			
64	4		AN935-2								6			

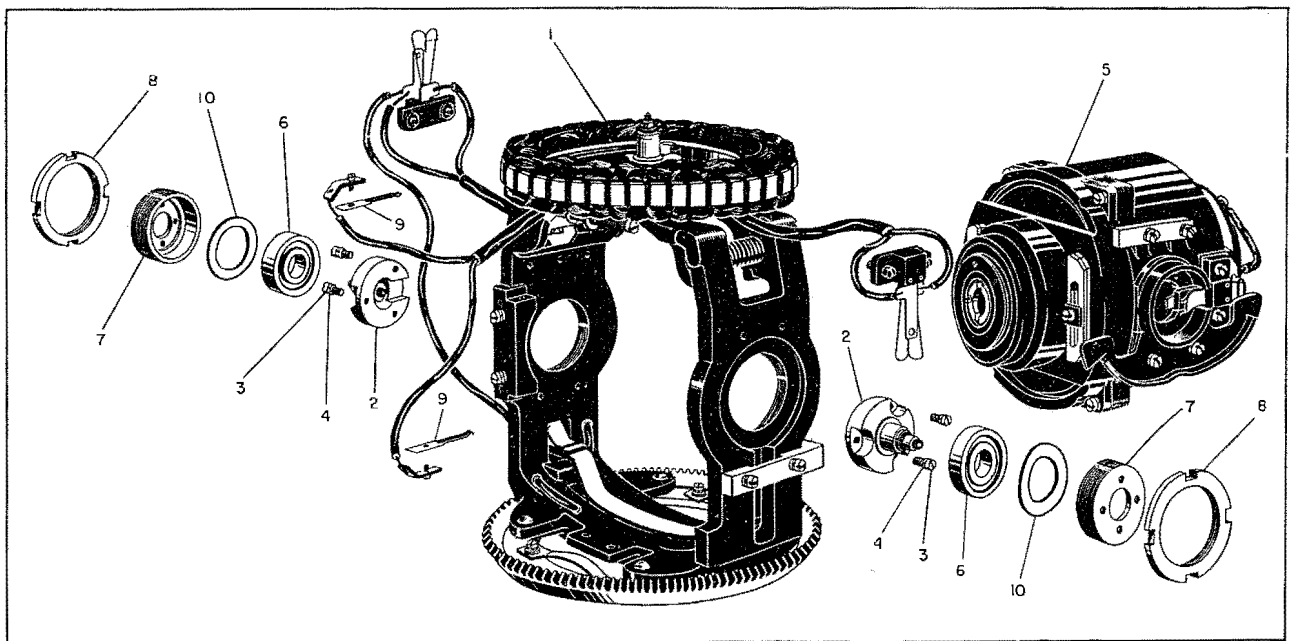


Figure 64 - Vertical Gimbal and Gyro Assy

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SECTION IX—GROUP ASSEMBLY PARTS LISTS

FIG. NO.	INDEX NO.	STOCKED	GROUP AIRCRAFT INSTRUMENTS						UNITS PER ASSY	PROPERTY CLASSIFICATION		
			MAJOR ASSEMBLY DIRECTIONAL GYRO INDICATOR, R88-I-1006							U.S. NAVY	U.S. ARMY	BRITISH
			PART NUMBER	1	2	3	4	5				
64	5		659585						Gyro Unit Assy (see figure 67 for breakdown)	1		
64	6		R4						Bearing - Ball (ND) (No.205596)	2		
64	7		804843						Cap - Bearing	2		
64	8		199363						Retainer - Lock	2		
64	9		199388						Brush - Multifinger	2		
64	10		232890						Spacer	2		
									VERTICAL RING AND MOTOR ASSY			
64	1		79012						Vertical Ring & Motor Assy	1		
65	1		79010						Ring Assy - Vertical (see figure 66 for breakdown)	1		
65	2		649550						Stator Assy - Torque motor	1		
65			*804852						Stacking Assy	1		
65			*804850						Lamination	13		
65			*804851						Insulator	2		
65			*comm						Fishpaper - .010 thick x 9/32 x 1-1/16 in.	40		
65			*comm						Fishpaper - .015 thick x 1/8 x 3/16 in.	40		
65			*P69843						Wire - Magnet, No. 38 AWG, green, 1-1/4 oz	1		
65			*P690120						Cable - No. 27 AWG, black, 6 in. long	1		
65			*P690120						Cable - No. 27 AWG, white, 6 in. long	1		
65			*P690120						Cable - No. 27 AWG, green, 6 in. long	1		
65			*P690120						Cable - No. 27 AWG, yellow, 6 in. long	1		
65			*comm						Tubing - No. 11, .095 x 1-3/4 in. long, XTE-130, Irv-o-lite, black	1		
65			*comm						Tubing - No. 15, .059 x 3/8 in. long, XTE-130, Irv-o-lite, black	4		
65	3		199270						Clamp	4		
65	4		230090						Screw - Self-tapping	4		
65	5		649551						Transformer Assy - Control	1		
65			*199440						Plate - Terminal	1		
65			*199441						Bracket	1		
65			*201221						Lamination & Winding Assy	1		
65			*199436						Winding Assy	1		
65			*199433						Lamination	50		
65	6		AN501C2-3						Screw - Fil-hd	2		
65	7		AN935-2						Washer - Med spring lock	2		
65	8		AN960C2						Washer - Plain	2		
65	9		199280						Insulator	2		
65	6		AN501C2-3						Screw - Fil-hd	4		
65	10		210361						Contact Assy	1		
65			*199315						Contact Assy	1		
65			*199316						Contact	1		
65			*199317						Contact	1		
65			*comm						Tubing - Flex. plastic, No. 10, .106 x 7/16 in. long, type GP, black	1		
65	11		210366						Clamp	1		
65	12		210367						Counterweight	1		
65	13		AN501C2-5						Screw - Fil-hd	2		
65	7		AN935-2						Washer - Med spring lock	2		

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SECTION IX - GROUP ASSEMBLY PARTS LISTS

FIG. NO.	INDEX NO.	STOCKED	GROUP AIRCRAFT INSTRUMENTS							UNITS PER ASSY	PROPERTY CLASSIFICATION			
			MAJOR ASSEMBLY DIRECTIONAL GYRO INDICATOR, R88-I-1006								U.S. NAVY	U.S. ARMY	BRITISH	
			PART NUMBER	1	2	3	4	5	6					NOMENCLATURE
65	14		234263						Contact Assy	1				
65			*199365						Contact Assy	1				
65			*248315						Contact Assy	1				
65			*199349						Spring	1				
65			*248316						Support	1				
65			*248317						Contact - Flex.	1				
65			*199347						Contact	1				
65		15	234262						Contact Assy	1				
65				*199365						Contact Assy	1			
65				*248315						Contact Assy	1			
65			*199349						Spring	1				
65			*248316						Support	1				
65			*248317						Contact - Flex.	1				
65			*199347						Contact	1				
65		16	234300						Contact Assy	1				
65				*199315						Contact Assy	1			
65				*199316						Contact	1			
65			*199317						Contact	1				
65														

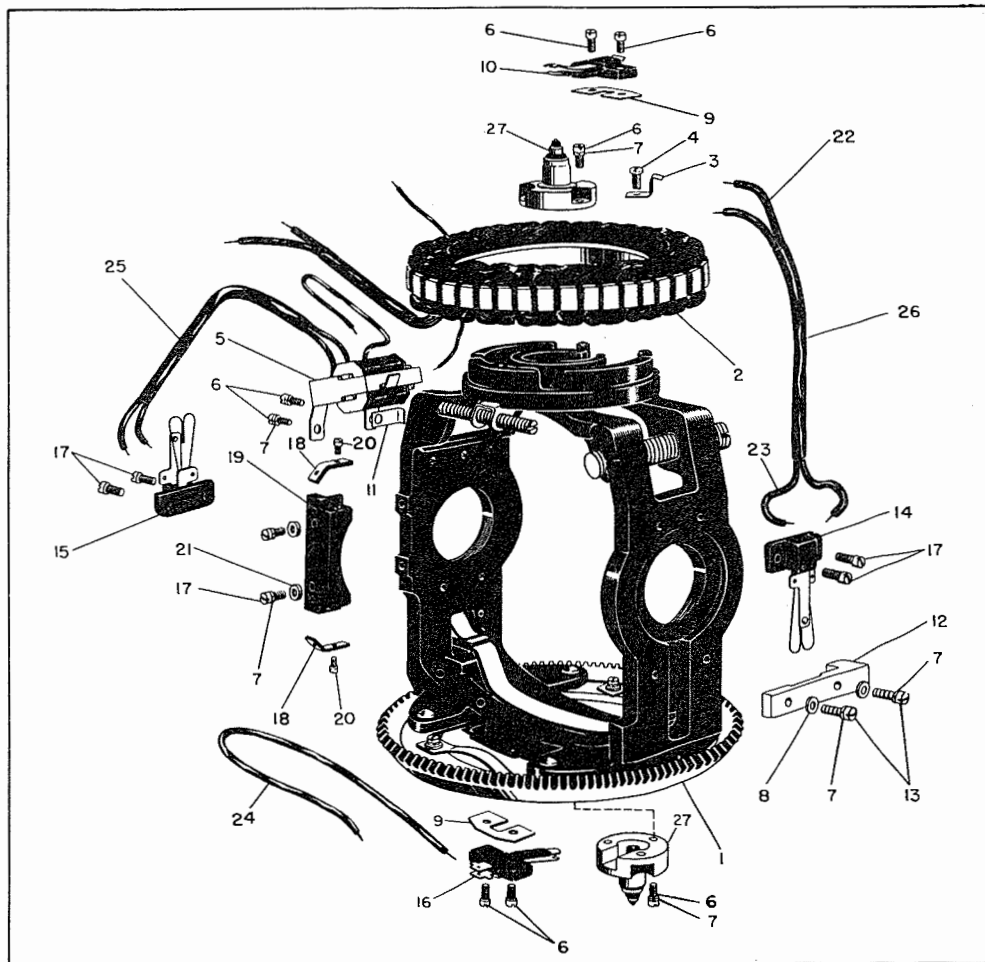


Figure 65 - Vertical Ring and Motor Assy

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SECTION IX-GROUP ASSEMBLY PARTS LISTS

FIG. NO.	INDEX NO.	STOCKED	GROUP AIRCRAFT INSTRUMENTS							UNITS PER ASSY	PROPERTY CLASSIFICATION				
			MAJOR ASSEMBLY DIRECTIONAL GYRO INDICATOR, R88-I-1006								U.S. NAVY	U.S. ARMY	BRITISH		
			PART NUMBER	1	2	3	4	5	6					NOMENCLATURE	
65			*comm								Tubing - Flex. plastic, No. 10, .106 x 7/16 in. long, type GP, black	1			
65	17		AN501C2-4								Screw - Fil-hd	4			
65	18		199387								Terminal	2			
65	19		199386								Holder Assy - Brush	1			
65			*199384								Insert	2			
65	20		AN501C0-2								Screw - Fil-hd	2			
65	17		AN501C2-4								Screw - Fil-hd	2			
65	21		186026								Washer	2			
65	7		AN935-2								Washer - Med spring lock	2			
65	22		P690138								Cable - No. 24 AWG, green, 4 in. long	1			
65	23		P690138								Cable - No. 24 AWG, yellow, 4 in. long	1			
65	24		P690138								Cable - No. 24 AWG, red, 5 in. long	1			
65	25		comm								Tubing - No. 11, .095 x 1-7/8 in. long, XTE-130, Irv-o-lite, black	1			
65	26		comm								Tubing - No. 10, 1-3/4 in. long, XTE- 130, Irv-o-lite, black	1			
65	27		199292								Flange Assy	2			
65			*199294								Flange	1			
65			*199290								Contact Assy	1			
65			*199289								Sleeve	1			
65			*199293								Rod	1			
65	6		AN501C2-3								Screw	6			
65	7		AN935-2								Washer - Med spring lock	6			
											VERTICAL RING ASSY				
65	1		79010								Ring Assy - Vertical	1			
66	1		649532								Ring - Vertical	1			
66	2		804844								Gear (48-pitch - 156-tooth)	1			
66	3		S3129								Rivet (JLT) (No. 210700)	4			
66	4		199362								Shoe - Brake	2			
66	5		199361								Spring	2			
66	6		AN960C2								Washer	2			
66	7		AN935-2								Washer - Med spring lock	2			
66	8		AN501C2-3								Screw - Fil-hd	2			
66	9		211542								Spring - Retaining	1			
66	10		211543								Screw - Balancing	1			
66	11		232210								Plunger	1			
66	12		232211								Shoe - Adj	1			
66	13		comm								Nut - Hex, .099 in. - 56 cor. res. steel	1			
66	14		199368								Spring - Leaf	1			
66	15		199432								Pin - Pivot	1			
66	16		199434								Clip - Spring	2			
66	17		199367								Spring	1			
66	8		AN501C2-3								Screw - Fil-hd	1			
66	7		AN935-2								Washer - Med spring lock	1			
66	18		199323								Screw Assy - Balance	2			
66	19		199319								Bracket	1			
66	20		199318								Screw	1			
66	21		230090								Screw - Self-tapping	2			

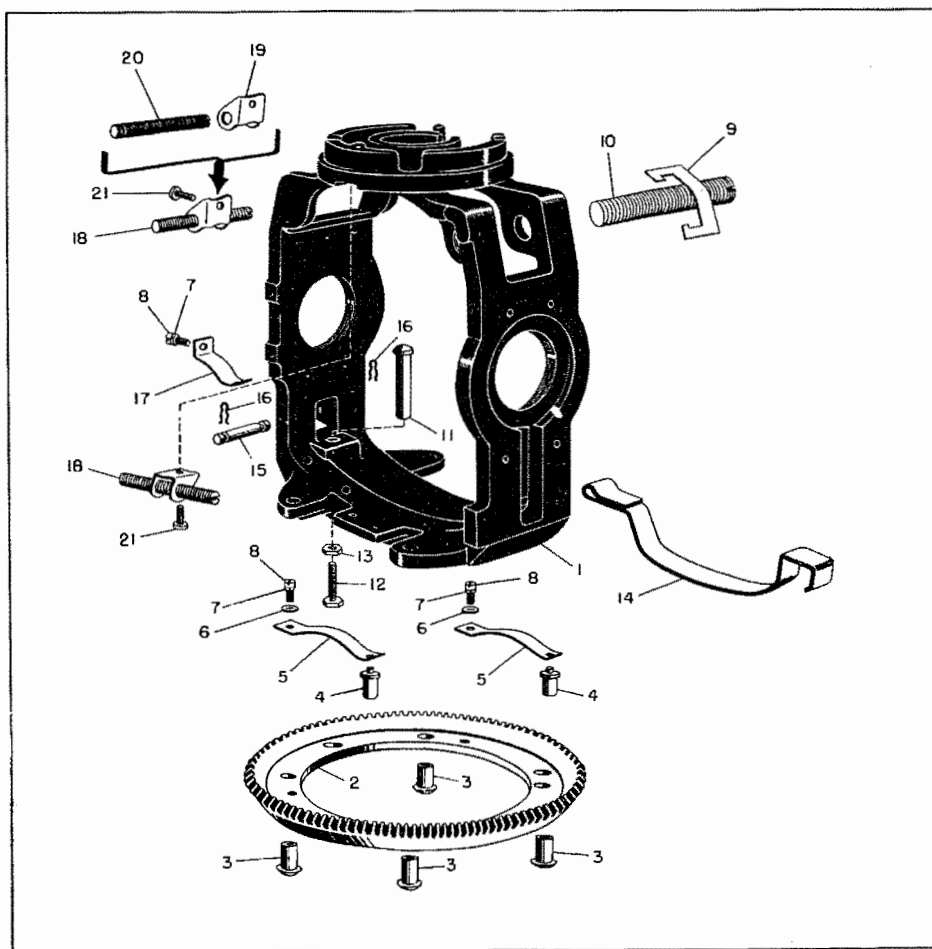
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Figure 66 - Vertical Ring Assy

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SECTION IX—GROUP ASSEMBLY PARTS LISTS

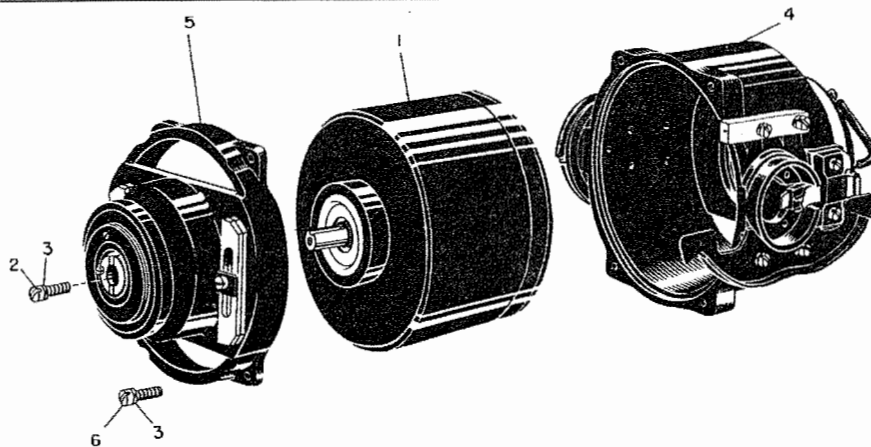
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Figure 67 - Gyro Unit Assy

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SECTION IX -- GROUP ASSEMBLY PARTS LISTS

FIG. NO.	INDEX NO.	STOCKED	GROUP AIRCRAFT INSTRUMENTS							UNITS PER ASSY	PROPERTY CLASSIFICATION		
			MAJOR ASSEMBLY DIRECTIONAL GYRO INDICATOR, R88-I-1006								U.S. NAVY	U.S. ARMY	BRITISH
			PART NUMBER	1	2	3	4	5	6				
68	4		818461						Cap - Rotor	1			
68	5		244007						Bearing - Ball	2			
68	6		232115						Washer	2			
68	7		162009						Spring	1			
68	8		AN501C3-6						Screw - Fil-hd	4			
68	9		AN935-3						Washer - Med spring lock	4			
68	10		249663						Retainer - Grease	2			
68	11		249664						Retainer - Grease	2			
68	12		249667						Ring - Snap	2			
									CASE ASSY				
67	4		708176						Case Assy	1			
69	1		78999						Case	1			
69	2		210361						Contact Assy	1			
69			*199315						Contact Assy	1			
69			*199316						Contact	1			
69			*199317						Contact	1			
69			*comm						Tubing - Flex. plastic, No. 10,.106x7/16 in. long, type GP, black	1			
69	3		199280						Insulator	2			
69	4		comm						Screw - Fil-hd, .086-64 x 5/32 in. cor.res. steel	4			
69	5		234303						Contact Assy	1			
69			*199315						Contact Assy	1			
69			*199316						Contact	1			
69			*199317						Contact	1			
69			*comm						Tubing - Flex. plastic, No. 10,.106x7/16 in. long, type GP, black	1			
69	6		210362						Switch & Lead Assy - Leveling	1			
69			*199381						Switch Assy	1			
69			*199382						Segment - Switch	1			

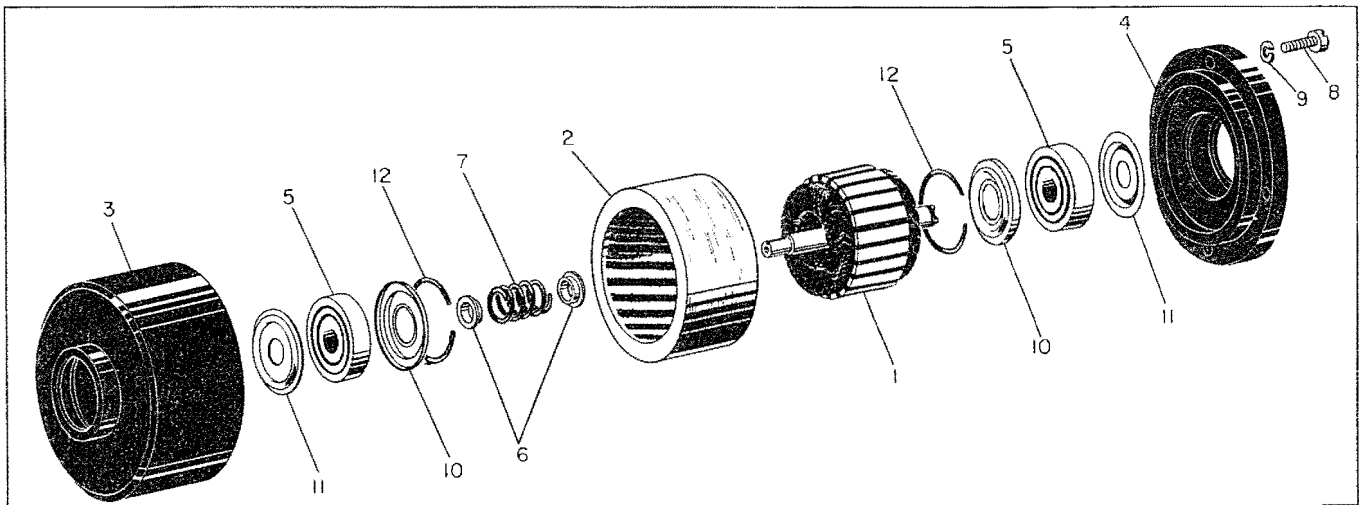


Figure 68 - Rotor Unit Assy

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SECTION IX - GROUP ASSEMBLY PARTS LISTS

FIG. NO.	INDEX NO.	STOCKED	GROUP AIRCRAFT INSTRUMENTS							UNITS PER ASSY	PROPERTY CLASSIFICATION		
			MAJOR ASSEMBLY DIRECTIONAL GYRO INDICATOR , R88-I-1006								U.S. NAVY	U.S. ARMY	BRITISH
			PART NUMBER	1	2	3	4	5	6	NOMENCLATURE			
69			*P690138						Cable - No. 24 AWG, blue, 2-1/8 in. long	1			
69			*P690138						Cable - No. 24 AWG, red, 1/2 in. long	1			
69	7		199369						Cam	1			
69	8		AN501C2-4						Screw - Fil-hd	2			
69	9		AN935-2						Washer - Med spring lock	2			
69	10		199380						Contact Assy	1			
69			*199366						Contact	3			
69			*199393						Stud	1			
69	11		199314						Insulator	1			
69	12		AN510C2-3						Screw - FH	3			
69	13		210363						Counterweight	1			
69	8		AN501C2-4						Screw - Fil-hd	2			
69	9		AN935-2						Washer - Med spring lock	2			
69	14		199383						Weight Assy - Compensator	1			
69			*211064						Weight Assy - Lock ring	1			
69			*804847						Weight	1			
69			*199385						Stop - Screw	1			
69	15		P690138						Cable - No. 24 AWG, yellow, 2-1/4 in. long	1			
69	16		P690138						Cable - No. 24 AWG, red, 1-3/4 in. long	1			
69	17		P690138						Cable - No. 24 AWG, green, 2-1/4 in. long	1			

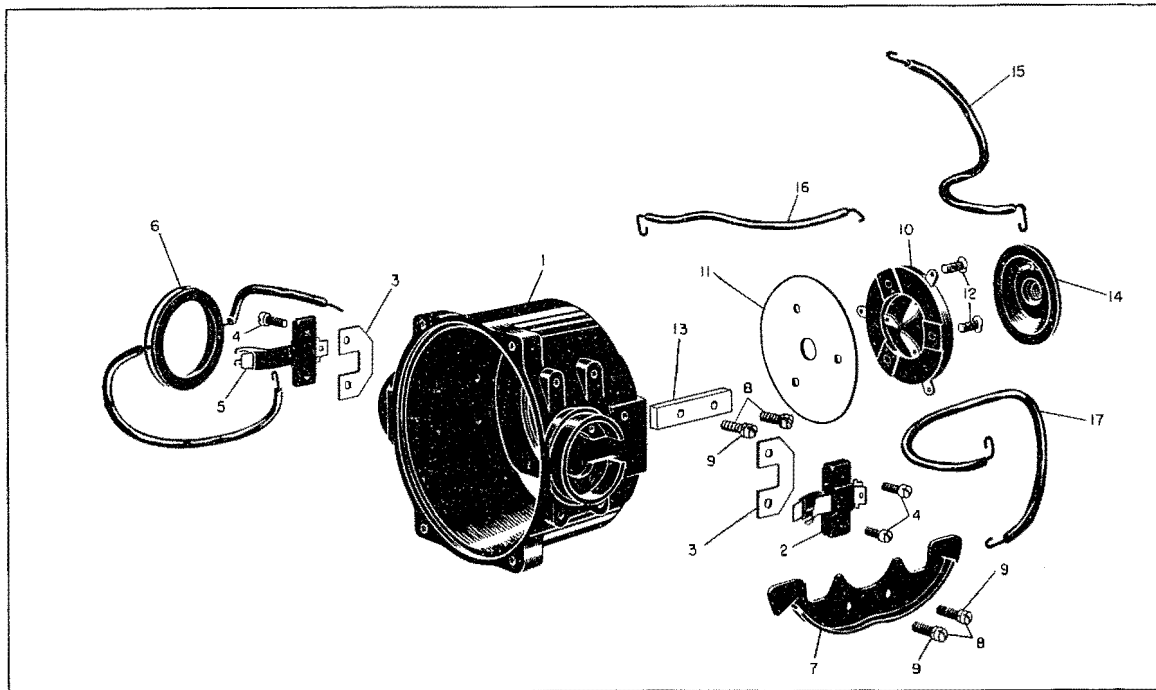


Figure 69 - Case Assy

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SECTION IX - GROUP ASSEMBLY PARTS LISTS

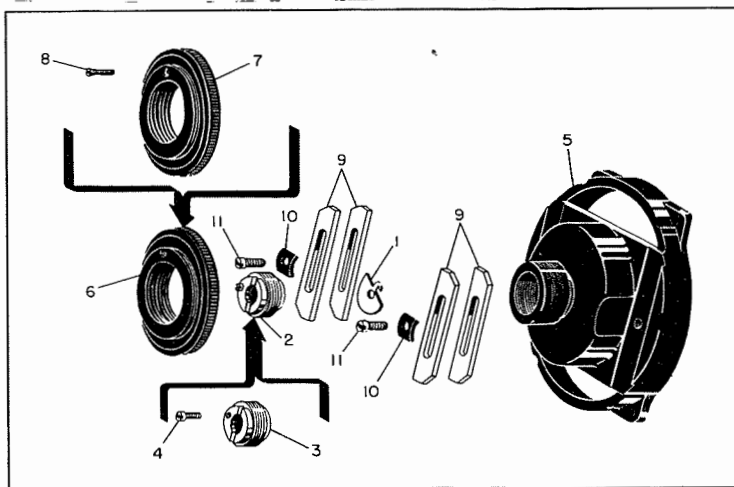
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Figure 70 - Housing Assy

AN 05-20HD-1
SECTION IX - GROUP ASSEMBLY PARTS LISTS

FIG. NO.	INEX NO.	S T O C K E D	GROUP AIRCRAFT INSTRUMENTS								UNITS PER ASSY	PROPERTY CLASSIFICATION		
			MAJOR ASSEMBLY DIRECTIONAL GYRO INDICATOR, R88-I-1006									U.S. NAVY	U.S. ARMY	BRITISH
			PART NUMBER	1	2	3	4	5	6	NOMENCLATURE				
71	11		224361						Washer - Slide	1				
71	12		224412						Connector - Spring	1				
71	13		AN935-2						Washer - Med spring lock	1				
71	14		AN501C2-3						Screw - Fil-hd	1				
71	15		224402						Spring	1				
71	16		234294						Pin - Stop	3				
									DIAL ASSY					
63	13		661570						Dial Assy	1				
72	1		649530						Bracket - Dial	1				
72	2		R2X1228U						Bearing - Ball (ND) (No. 199435)	2				
72	3		199452						Hub - Dial	1				
72	4		804863						Gear (48-pitch - 156-tooth)	1				
72	5		199454						Washer - Spring	2				

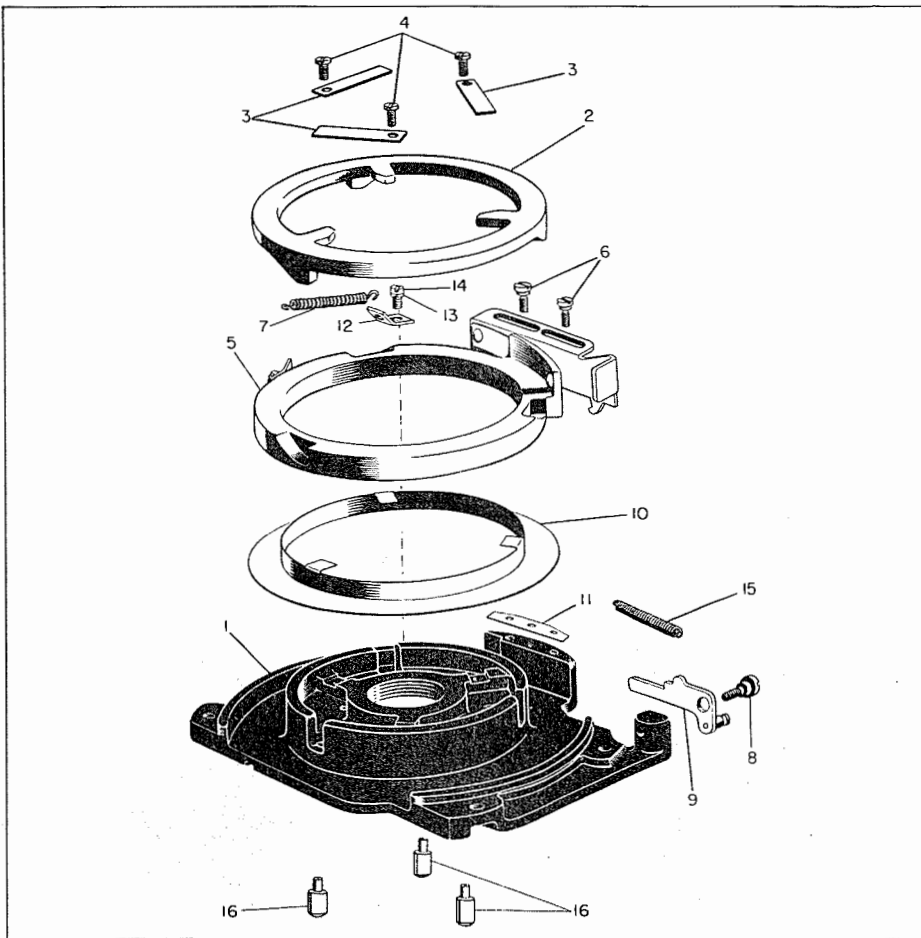


Figure 71 - Bottom Bracket Assy

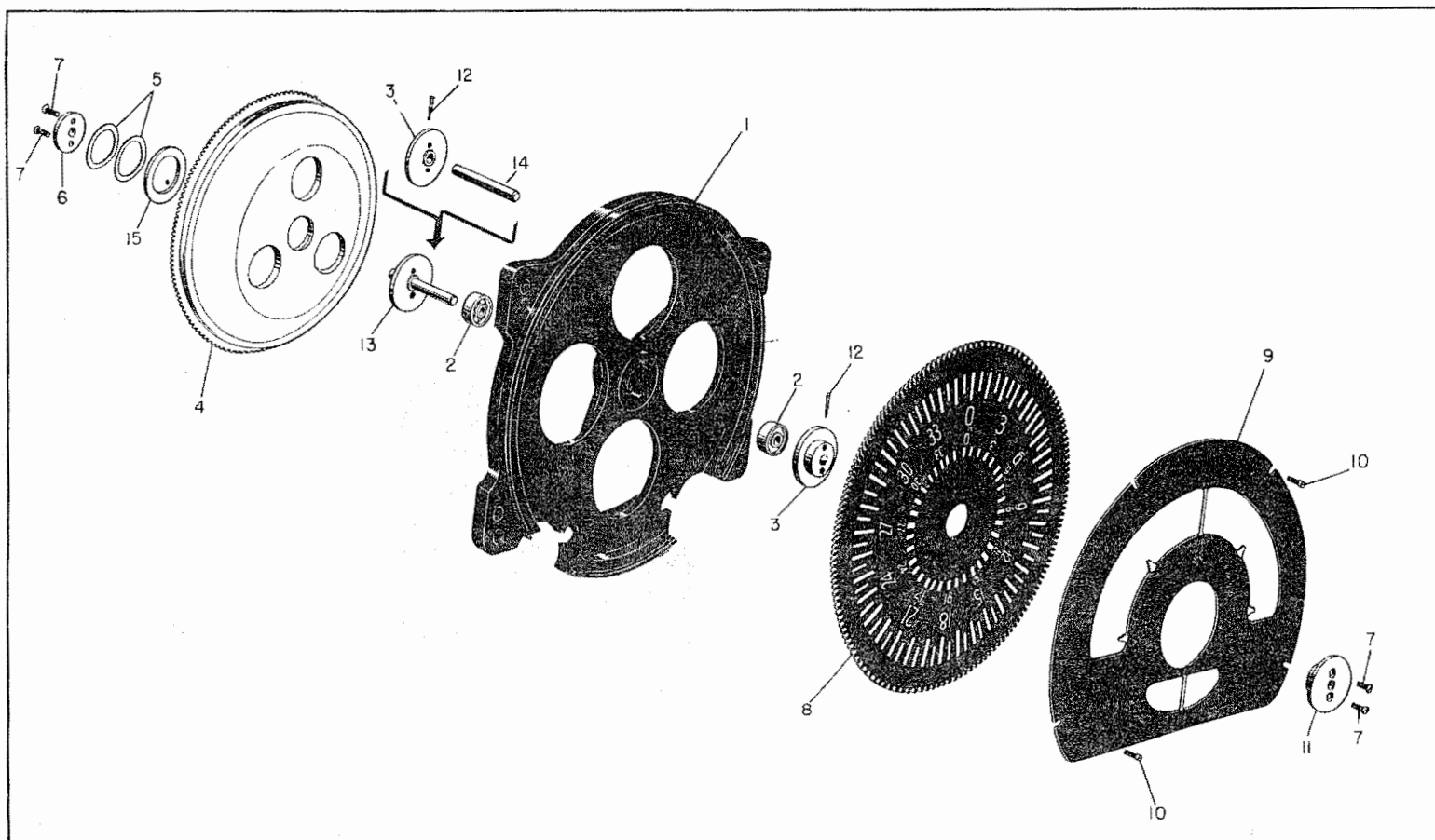
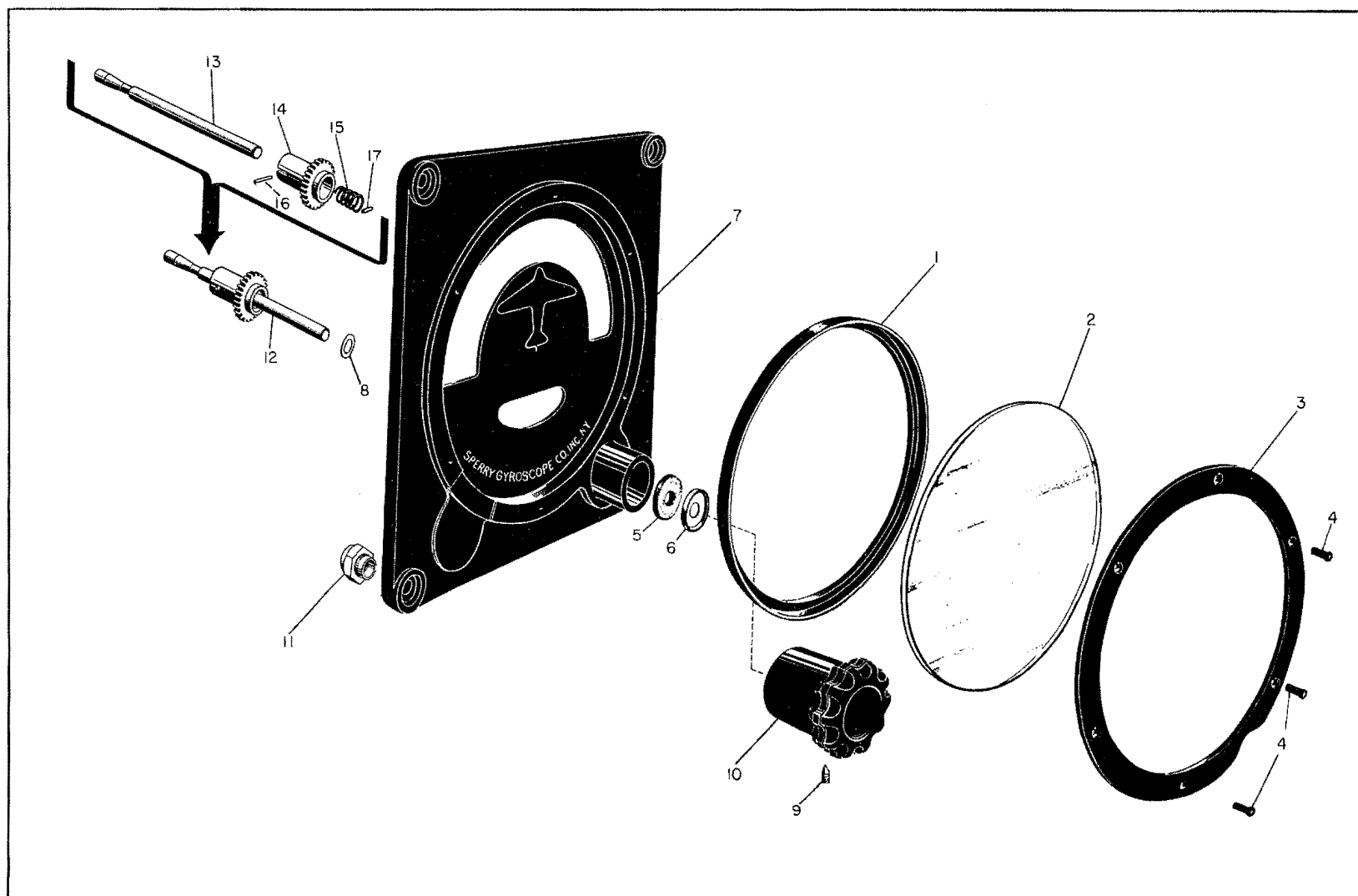


Figure 72 - Dial Assy



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SECTION IX-GROUP ASSEMBLY PARTS LISTS

FIG. NO.	INDEX NO.	STOCKED	GROUP AIRCRAFT INSTRUMENTS							UNITS PER ASSY	PROPERTY CLASSIFICATION			
			MAJOR ASSEMBLY DIRECTIONAL GYRO INDICATOR, R88-I-1006								U.S. NAVY	U.S. ARMY	BRITISH	
			PART NUMBER	1	2	3	4	5	6					NOMENCLATURE
72	6		199451								1			
72	7		AN510CO-3								2			
72	8		199448								1			
72	9		804865								1			
72	10		AN501C1-2								4			
72	11		199450								1			
72	7		AN510CO-3								2			
72	12		209925								1			
72	13		233997								1			
72	14		199449								1			
72	3		199452								1			
72	12		209925								1			
72	15		234826								1			

3

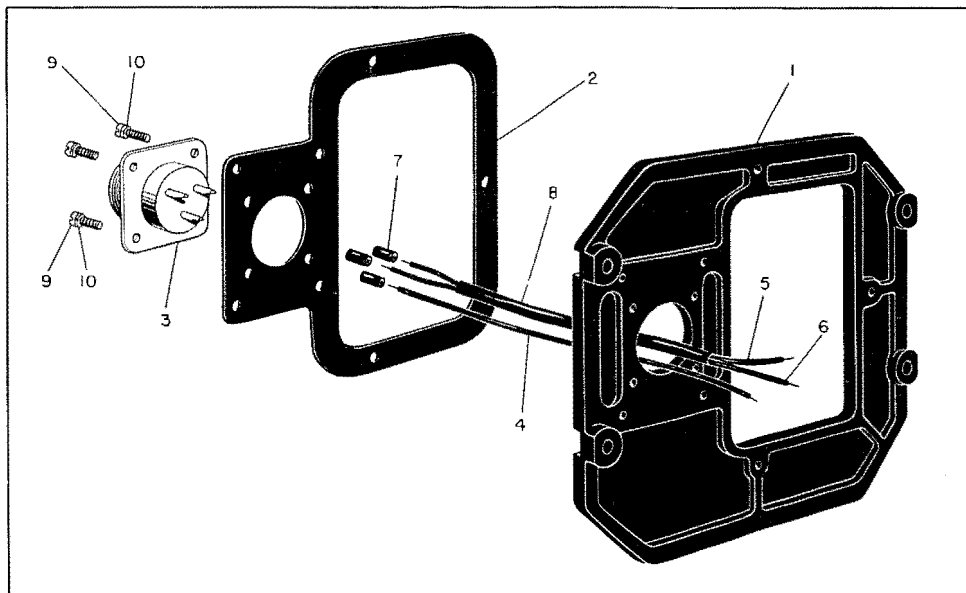
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Figure 74 - Back Plate Assy

SECTION IX-GROUP ASSEMBLY PARTS LIST

FIG. NO.	INDEX NO.	STOCKED	GROUP AIRCRAFT INSTRUMENTS							UNITS PER ASS'Y.	PROPERTY CLASSIFICATION	
			MAJOR ASSEMBLY DIRECTIONAL GYRO INDICATOR, TYPE C-5								U. S. NAVY	U. S. ARMY
			PART NUMBER	1	2	3	4	5	6			
			TYPE C-5 DIRECTIONAL GYRO INDICATOR ASSEMBLY (cont)									
75	37		293382						Contact Assy	1		
									ATTACHING PARTS			
75	38		0406-076						Screw - Fil h .086-64 NF-3 x 3/16 in.	2		
									corrosion res steel			
									*			
75	39		234090						Contact Assy	1		
									ATTACHING PARTS			
75	40		0406-076						Screw - Fil h .086-64 NF-3 x 3/16 in.	2		
									corrosion res steel			
									*			
75	41		297286						Flange and Bearing Assy	2		
									ATTACHING PARTS			
75	42		0406-076						Screw - Fil h .086-64 NF-3 x 3/16 in.	6		
									corrosion res steel	6		
75	43		299294						Washer			
									*			
75	44		199363						Nut - Lock	2		
75	45		824101						Cap - Ball bearing	2		
75	46		232890						Spacer	2		
75	47		SR4X1378W						Bearing - Ball (ND) (Sperry Part No. 205596)	2		
75	48		288509						Flange Assy	2		
75	49		653515						Bracket Assy - Bottom(see figure 79 for breakdown)	1		
									ATTACHING PARTS			
75	50		304822						Screw	4		
75	51		AN935-4						Washer - Medium spring lock for .112 in. screw	4		
									*			
75	52		225957						Clip	1		
75	53		Com1						Sleeve - Flexible plastic No. 16 .053 ID x 1 in. long type GP clear (SUR)			
									(Sperry Part No. 0341-234)	1		
75	54		652411						Ring and Gyro Assy (see figure 80 for breakdown)	1		
75	55		814066						Bracket Assy - Top	1		
									ATTACHING PARTS			
75	56		0406-150						Screw - Fil h .112-48 NF-3 x 5/16 in.	4		
									corrosion res steel	4		
75	57		AN935-4						Washer - Medium spring lock for .112 in. screw			
									*			
75	58		804870						Cage Assy - Squirrel	1		
									ATTACHING PARTS			
75	59		Com1						Screw - Binding hd .099-56 x 3/16 in.corrosion res steel	3		
									(AXS)(Sperry Part No. 0453-108)	3		
75	60		234179						Clamp			
									*			
75	61		234294						Pin - Spacer	3		
75	62		814064						Bracket	1		
75	63		234866						Clamp	2		
75	64		616						Terminal - Soldering (TBC)(Sperry Part No.092-1)	1		
75	65		804877						Plate - Back	1		
									ATTACHING PARTS			
75	66		0406-148						Screw - Fil h .112-48 NF-3 x 1/4 in.	4		
									corrosion res steel	4		
75	67		AN935-4						Washer - Medium spring lock for .112 in. screw			
									*			
75	68		649541						Chassis	1		
									COVER ASSEMBLY			
76	-		822833						Cover Assy (see figure 75-6 for next higher assembly)	Ref		
76	1		276668						Plate - Instruction	1		
76	2		284199						Plate - Name	1		
									ATTACHING PARTS			
76	3		Com1						Rivet - Tubular, oval hd .047 dia x 5/32 in. long, alum (TJL)(Sperry Part No. 0172-082)	4		
									*			
76	4		284200						Plate - Name	1		

SECTION W - GROUP INSTRUMENT PARTS LIST											UNITS PER ASS'Y.	PROPERTY CLASSIFICATION	
FIG. NO.	INDEX NO.	STOCK QTY	GROUP AIRCRAFT INSTRUMENTS							U. S. NAVY		U. S. ARMY	
			MAJOR ASSEMBLY DIRECTIONAL GYRO INDICATOR, TYPE C-5										
			PART NUMBER	1	2	3	4	5	6	NOMENCLATURE			
										COVER ASSEMBLY (cont)			
										ATTACHING PARTS			
76	5		Com1							Rivet - Tubular, oval hd .047 dia x 5/32 in. long, alum (TJL)(Sperry Part No. 0172-082)	2		
										-----*			
76	6		706443							Cover	1		
76	-		248294							Breather Assy (No longer used on later models)	1		
										FRONT PANEL ASSEMBLY			
77	-		652409							Panel Assy - Front (see figure 75-18 for next higher assembly)	Ref		
77	1		818366							Cover - Cage knob	1		
77	2		5100-31							Ring - Retaining (WKI)(Sperry Part No.0183-12)	1		
77	3		254843							washer	1		
77	4		254903							Ring Gear and Knob Assy	1		
77	5		818279							Knob	1		
77	6		254844							Gear - Ring (64 pitch-51 tooth)	1		
77	7		254843							washer	1		
77	8		254840							Gear - Sun (64 pitch-27 tooth)	1		
										ATTACHING PART			
77	9		189322							Pin - Taper	1		
										-----*			
77	10		818311							Gear and Housing Assy	1		

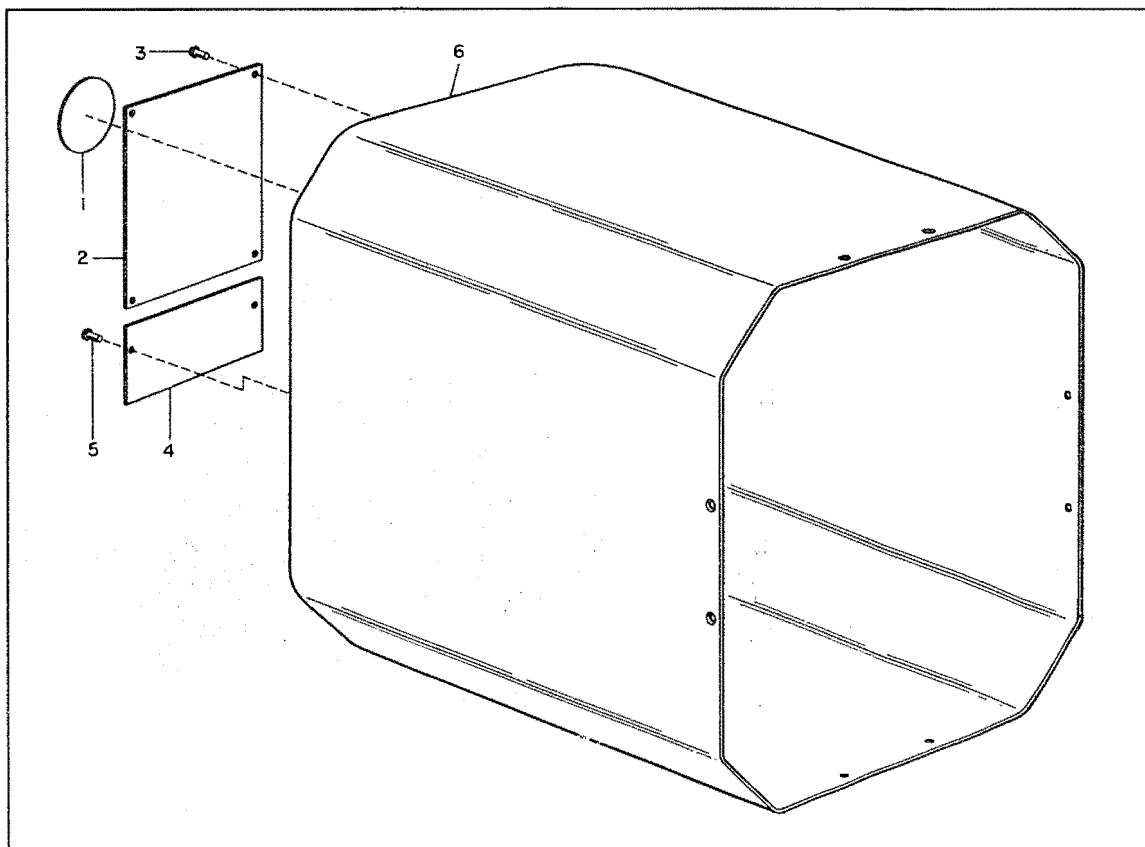


Figure 76. Cover Assembly

SECTION IX-GROUP ASSEMBLY PARTS LIST

FIG. NO.	INDEX NO.	SYMBOL	GROUP AIRCRAFT INSTRUMENTS						UNITS PER ASS'Y.	PROPERTY CLASSIFICATION	
			MAJOR ASSEMBLY DIRECTIONAL GYRO INDICATOR, TYPE C-5							U. S. NAVY	U. S. ARMY
			PART NUMBER	1	2	3	4	5	6		
									FRONT PANEL ASSEMBLY (cont)		
77	11		0406-083						ATTACHING PARTS Screw - Fil h .086-64/NF-3 x 7/16 in. corrosion res steel	3	
77	12		254845						Gear - Planet (64 pitch-12 tooth) ATTACHING PARTS	3	
77	13		254841						Shaft	3	
77	14		254836						Housing	1	
77	15		284887						Gear - Pinion (48 pitch-30 tooth) ATTACHING PART	1	
77	16		288446						Pin	1	
77	17		199515						Spring	1	
77	18		288447						Pin	1	
77	19		254838						Shaft	1	

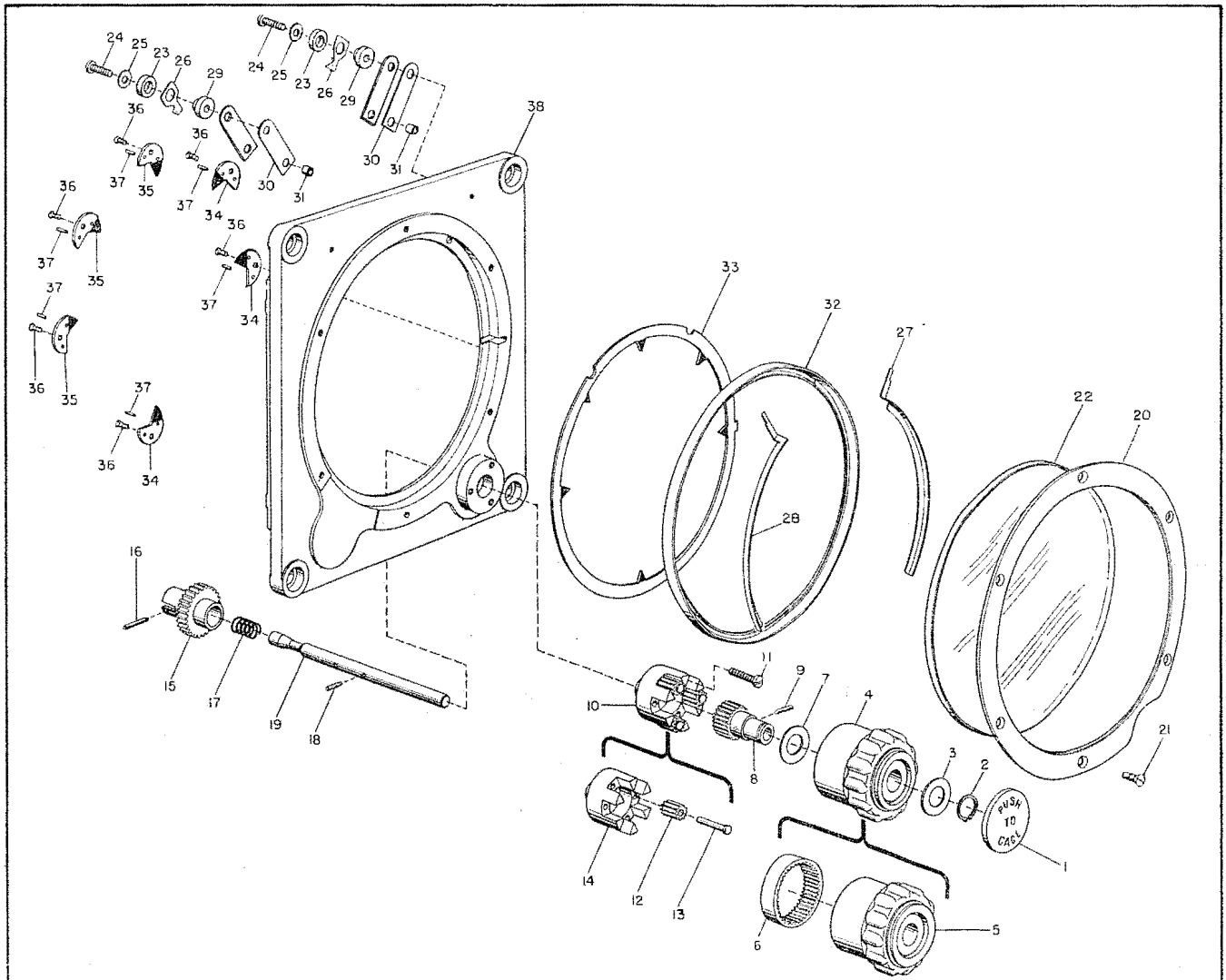


Figure 77. Front Panel Assembly

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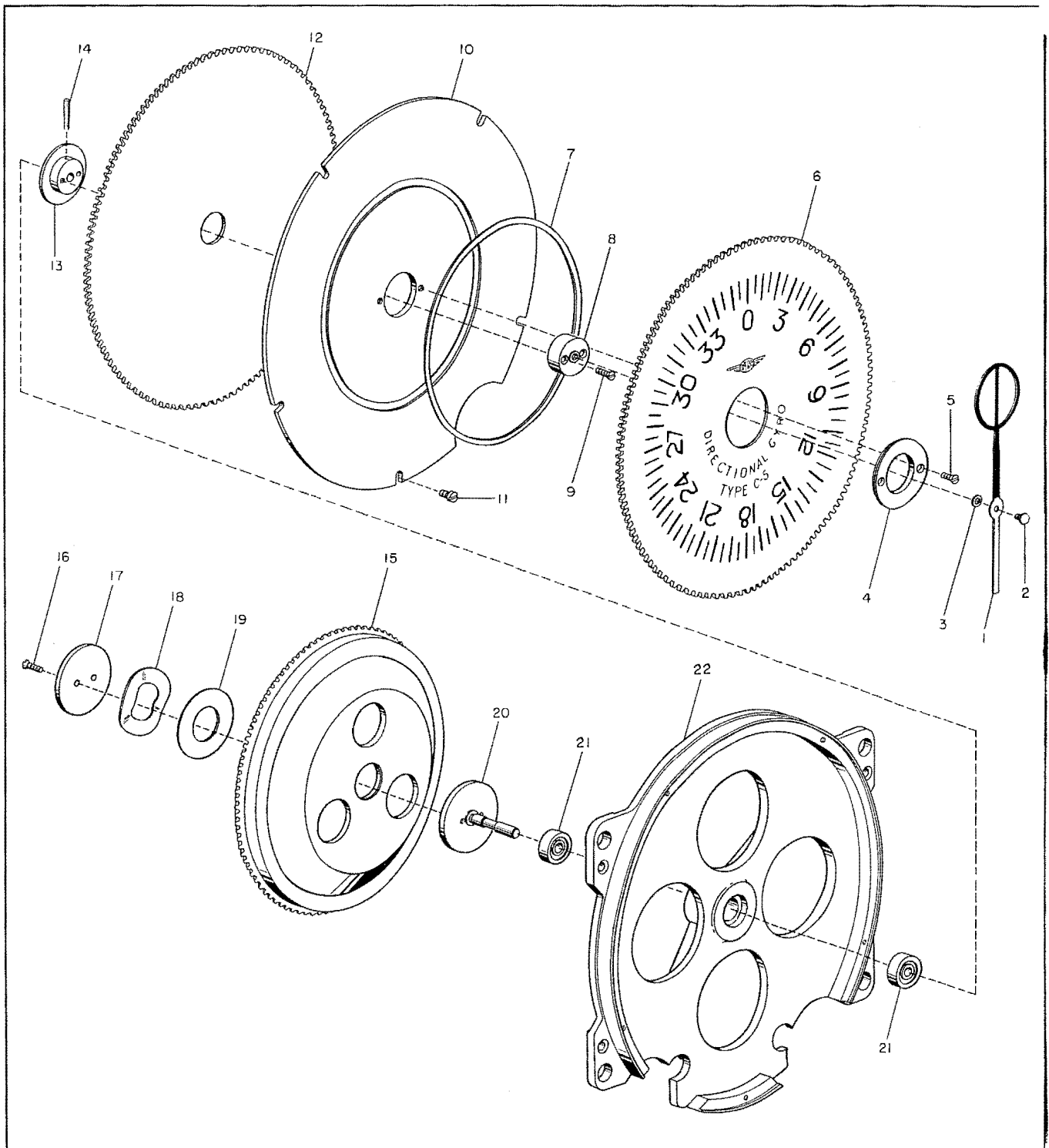


Figure 78. Dial Assembly

This exploded view diagram illustrates the assembly of a mechanical component, likely a door latch or hinge. The parts are numbered as follows:

- 1:** A coiled spring.
- 2:** A small bracket or pin component.
- 3:** A screw or bolt used to secure part 2.
- 4:** A coiled spring.
- 5:** A small rectangular plate or bracket.
- 6:** A screw or bolt used to secure part 5.
- 7:** A small pin or spacer.
- 8:** A large, circular, ring-like component with a flange.
- 9:** A screw or bolt.
- 10:** A small rectangular plate or bracket.
- 11:** A long, thin bracket or arm.
- 12:** A screw or bolt used to secure part 11.
- 13:** A long, thin bracket or arm, similar to part 11.
- 14:** A large, circular, ring-like component, similar to part 8.
- 15:** A small cylindrical pin or spacer.
- 16:** A large, complex base plate or housing with multiple mounting points.

The diagram shows the spatial relationship between these parts, indicating how they are assembled together. Dashed lines are used to show the alignment and assembly path for several components, such as the screws (9, 12, 15) and the pins (7, 15).

Revised 15 February 1951.

SECTION IX- GROUP ASSEMBLY PARTS LIST

FIG. NO.	INDEX NO.	STOCKED	GROUP AIRCRAFT INSTRUMENTS							UNITS PER ASS'Y.	PROPERTY CLASSIFICATION	
			MAJOR ASSEMBLY DIRECTIONAL GYRO INDICATOR, TYPE C-5								U. S. NAVY	U. S. ARMY
			PART NUMBER	1	2	3	4	5	6			
							</					

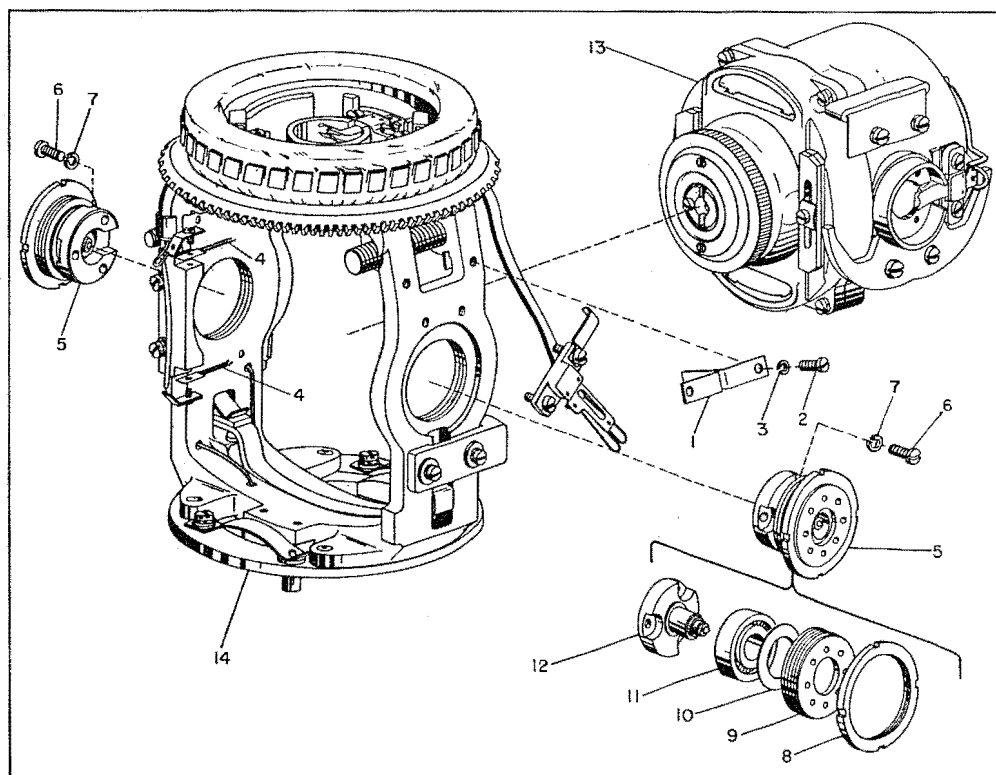


Figure 80. Ring and Gyro Assembly

SECTION IX- GROUP ASSEMBLY PARTS LIST

FIG. NO.	INDEX NO.	STOCK CODE	GROUP AIRCRAFT INSTRUMENTS						UNITS PER ASS'Y.	PROPERTY CLASSIFICATION	
			MAJOR ASSEMBLY DIRECTIONAL GYRO INDICATOR, TYPE C-5							U. S. NAVY	U. S. ARMY
			PART NUMBER	1	2	3	4	5			

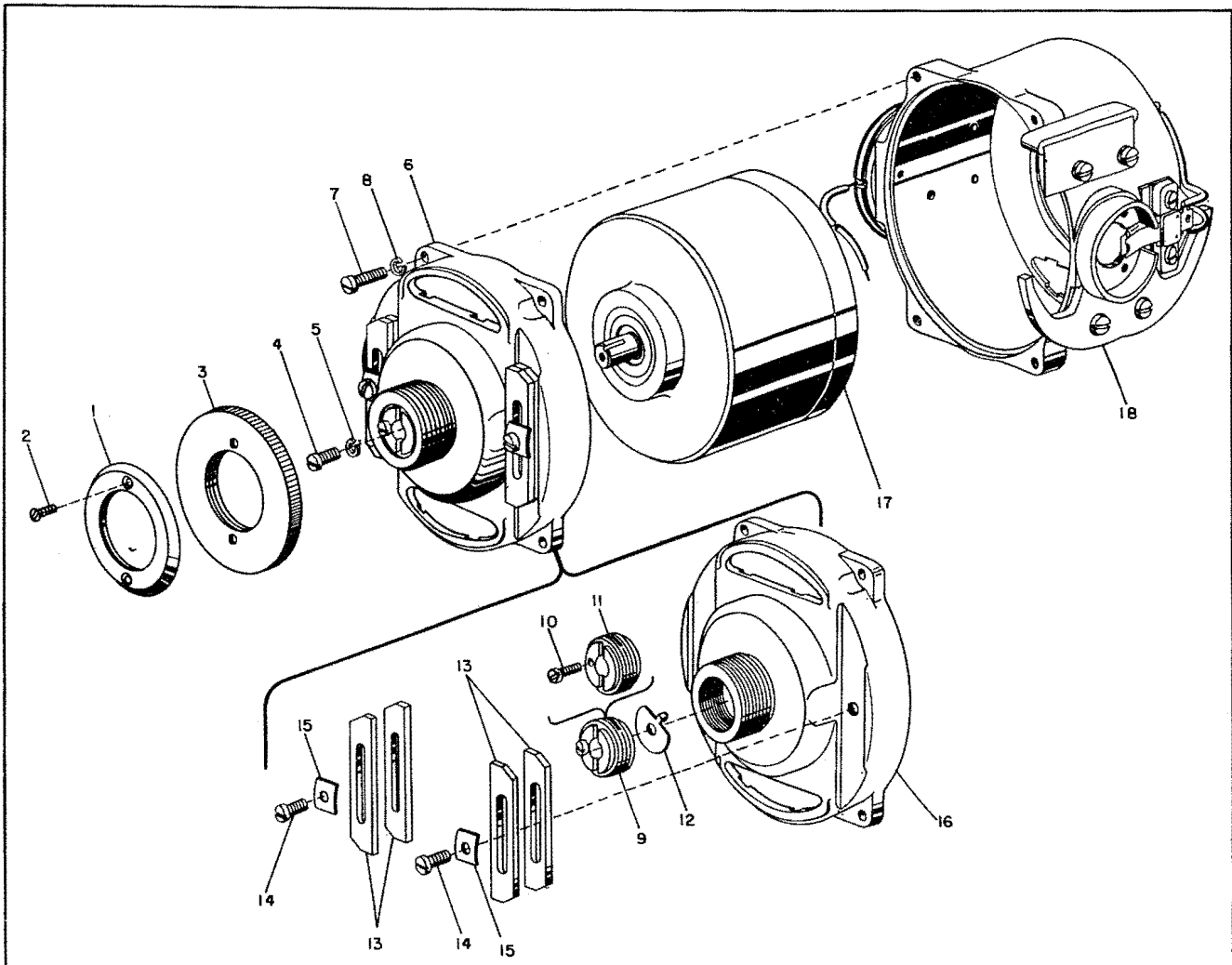


Figure 81. Gyro Assembly

SECTION IX- GROUP ASSEMBLY PARTS LIST

FIG. NO.	INDEX NO.	STOCK NO.	GROUP AIRCRAFT INSTRUMENTS						UNITS PER ASS'Y.	PROPERTY CLASSIFICATION	
			MAJOR ASSEMBLY DIRECTIONAL GYRO INDICATOR, TYPE C-5							U. S. NAVY	U. S. ARMY
			PART NUMBER	1	2	3	4	5			

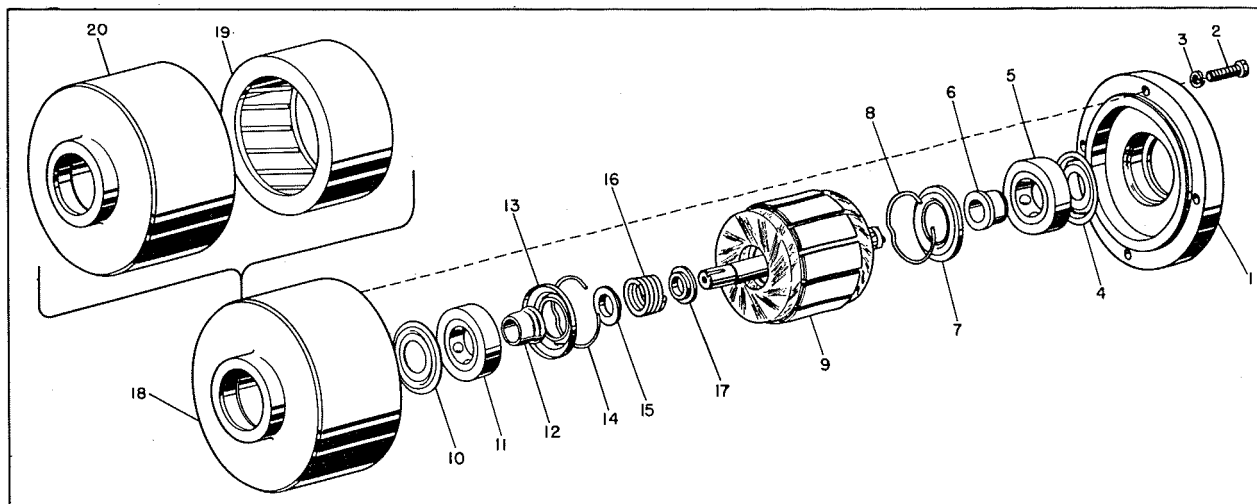


Figure 82. Rotor Assembly

SECTION IX- GROUP ASSEMBLY PARTS LIST

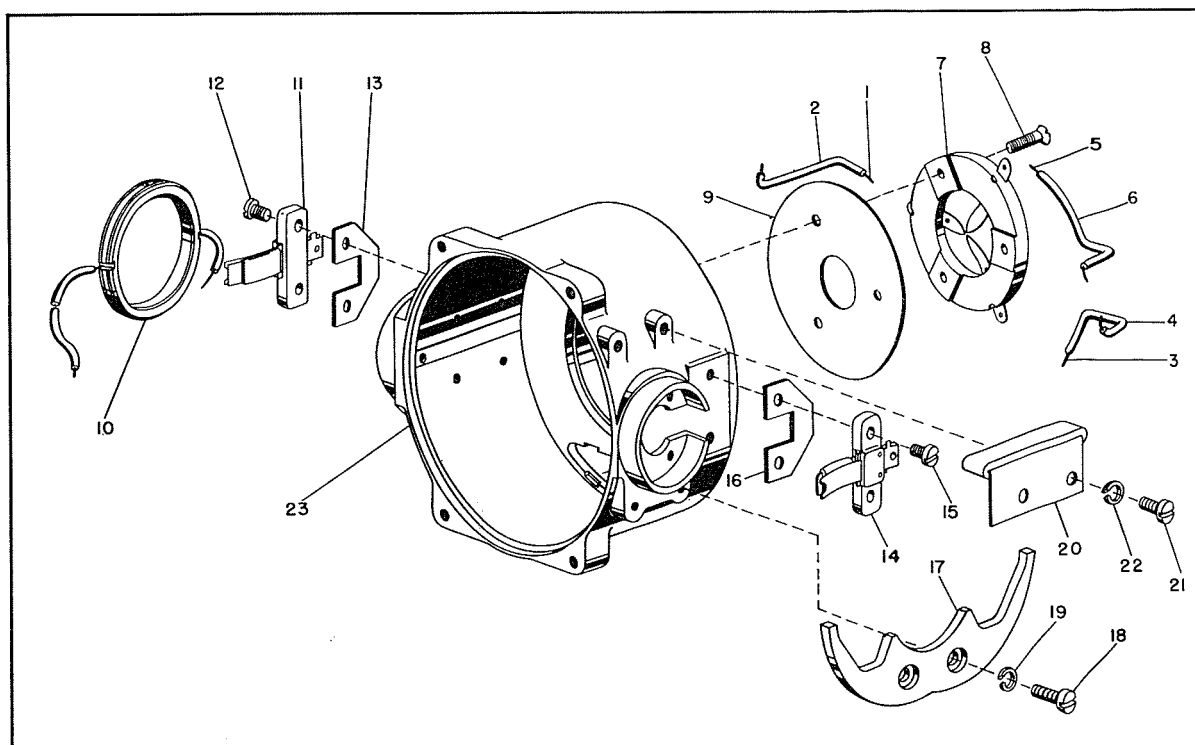
[illegible]

Figure 83. Case Assembly

SECTION IX- GROUP ASSEMBLY PARTS LIST

FIG. NO.	INDEX NO.	STOCK NO.	GROUP AIRCRAFT INSTRUMENTS						UNITS PER ASSY.	PROPERTY CLASSIFICATION	
			MAJOR ASSEMBLY		DIRECTIONAL GYRO INDICATOR, TYPE C-5					U. S. NAVY	U. S. ARMY
			PART NUMBER	1	2	3	4	5			

SECTION IX- GROUP ASSEMBLY PARTS LIST

FIG. NO.	INDEX NO.	STOCK ID	GROUP AIRCRAFT INSTRUMENTS							UNITS PER ASS'Y.	PROPERTY CLASSIFICATION	
			MAJOR ASSEMBLY DIRECTIONAL GYRO INDICATOR, TYPE C-5								U. S. NAVY	U. S. ARMY
			PART NUMBER	1	2	3	4	5	6			

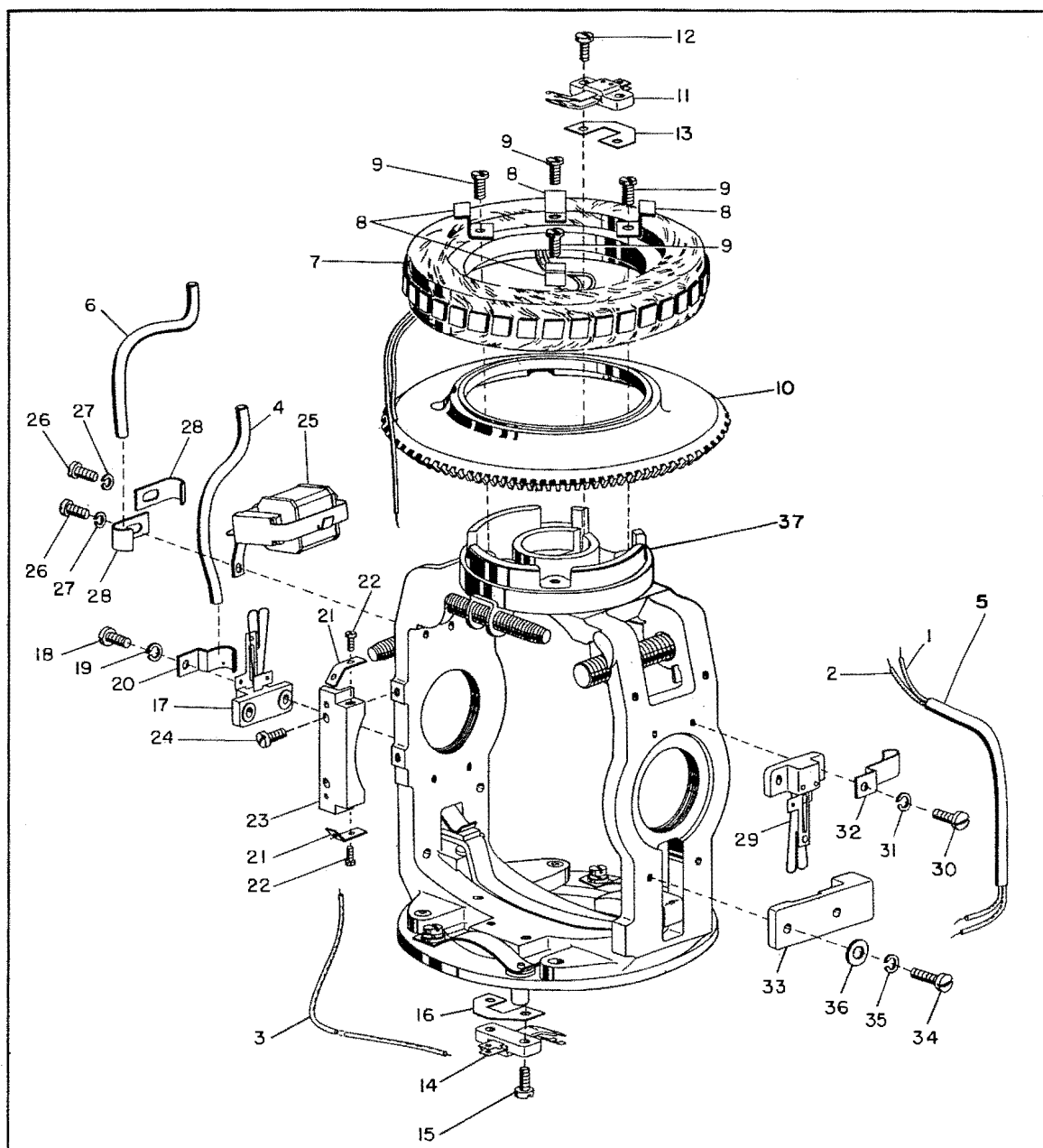


Figure 84. Ring and Stator Assembly

SECTION IX—GROUP ASSEMBLY PARTS LIST

FIG. NO.	INDEX NO.	STOCK NO.	GROUP AIRCRAFT INSTRUMENTS						UNITS PER ASSY.	PROPERTY CLASSIFICATION		
			MAJOR ASSEMBLY DIRECTIONAL GYRO INDICATOR, TYPE C-5							U. S. NAVY	U. S. ARMY	
			PART NUMBER	1	2	3	4	5				6
								</				



SECTION IX - GROUP ASSEMBLY PARTS LIST

FIG. NO.	INDEX NO.	STOCKED	GROUP AIRCRAFT INSTRUMENTS							UNITS PER ASS'Y.	PROPERTY CLASSIFICATION	
			MAJOR ASSEMBLY DIRECTIONAL GYRO INDICATOR, R88I1006-020-000								U. S. NAVY	U. S. ARMY
			PART NUMBER	1	2	3	4	5	6	NOMENCLATURE		
			DIRECTIONAL GYRO INDICATOR ASSEMBLIES (Cont)									
86	39		205596						Bearing - Ball	1		
86	40		288509						Contact Assy - Flange	1		
86	41		661180						Bracket Assy - Bottom (see fig. 89 for breakdown)	1		
			ATTACHING PARTS									
86	42		304822						Screw - Binding hd .112-48 NF-3 x 1/4 in. CRES	4		
86	43		Coml						Washer - Med spring lock for .112 in. screw (AXS) (Sperry Part No. 0164-05)	4		

86	44		225957						Clip	1		
86	45		659516						Ring and Gyro Assy (see fig. 90 for breakdown)	1		
86	46		814066						Bracket Assy - Top	1		
			ATTACHING PARTS									
86	47		0406-150						Screw - Fil h .112-48 NF-3 x 5/16 in. CRES	4		
86	48		Coml						Washer - Med spring lock for .112 in. screw (AXS) (Sperry Part No. 0164-05)	4		

86	49		804870						Cage Assy - Squirrel	1		
86	50		Coml						Screw - Binding hd .099-56 x 3/16 in. CRES (AXS) (Sperry Part No. 0453-108)	3		
86	51		234179						Clamp	3		
86	52		234294						Pin - Spacer	3		
86	53		814064						Bracket	1		
86	54		234866						Clamp	2		
86	55		616						Terminal - Soldering (TBC) (Sperry Part No. 092-1) (for No. 653290)	1		
86	55		205656						Clip - Wire (for No. 674174)	1		
86	56		804877						Plate - Back	1		
			ATTACHING PARTS									
86	57		0406-148						Screw - Fil h .112-48 NF-3 x 1/4 in. CRES	4		
86	58		Coml						Washer - Med spring lock for .112 in. screw (AXS) (Sperry Part No. 0164-05)	4		

86	59		659541						Chassis	1		
			FRONT PANEL ASSEMBLY									
87			663443						Panel Assy - Front (see fig. 86-20 for next higher assy) (for No. 653290)	Ref		
87			674425						Panel Assy - Front (see fig. 86-20 for next higher assy) (for No. 674174)	Ref		
87	1		818366						Cover - Cage knob	1		
87	2		5100-31						Ring - Retaining (WKT)(Sperry Part No. 0183-12)	1		
87	3		254843						Washer	1		
87	4		254903						Ring Gear and Knob Assy	1		
87	5		818279						Knob	1		
87	6		254844						Gear - Ring (64 pitch - 51 tooth)	1		
87	7		254843						Washer	1		
87	8		254840						Gear - Sun (64 pitch - 27 tooth)	1		
			ATTACHING PART									
87	9		189322						Pin - Taper	1		

87	10		818311						Gear and Housing Assy	1		
			ATTACHING PARTS									
87	11		0406-083						Screw - Fil h .086-64 NF-3 x 7/16 in. CRES	3		

87	12		293652						Gear - Planet (64 pitch - 12 tooth)	3		
			ATTACHING PARTS									
87	13		293651						Shaft - Gear	3		

87	14		293650						Housing	1		
87	15		284887						Gear - Pinion (48 pitch - 30 tooth)	1		
			ATTACHING PART									
87	16		288446						Pin	1		

87	17		199515						Spring	1		
87	18		288447						Pin	1		
87	19		254838						Shaft	1		
87	20		818531						Ring - Bezel clamp	1		

This exploded view diagram illustrates the assembly of a mechanical component, likely a pump or valve. The parts are numbered 1 through 35. Key components include:

- Part 1:** A circular button or cap with the text "PUSH TO CHARGE" (partially visible as "PUSH TO C").
- Parts 2-11:** Various internal components, including a large gear (4), a smaller gear (8), and several shafts and pins (2, 3, 5, 6, 7, 9, 10, 11).
- Parts 12-14:** A small assembly consisting of a housing (12), a pin (13), and a component (14).
- Parts 15-19:** A long shaft assembly (19) with a gear (15), a spring (17), and a pin (16).
- Parts 20-22:** A large circular cover or housing (20) with a gasket or seal (21) and a pin (22).
- Parts 23-31:** A series of small pins and washers (23, 24, 25, 26, 29, 30, 31) used for securing the main housing.
- Parts 32-35:** The main housing (32) with a central opening (33) and a mounting bracket (34).

The diagram uses dashed lines to show the alignment and assembly sequence of the parts.

1 January 1950

SECTION IX- GROUP ASSEMBLY PARTS LIST

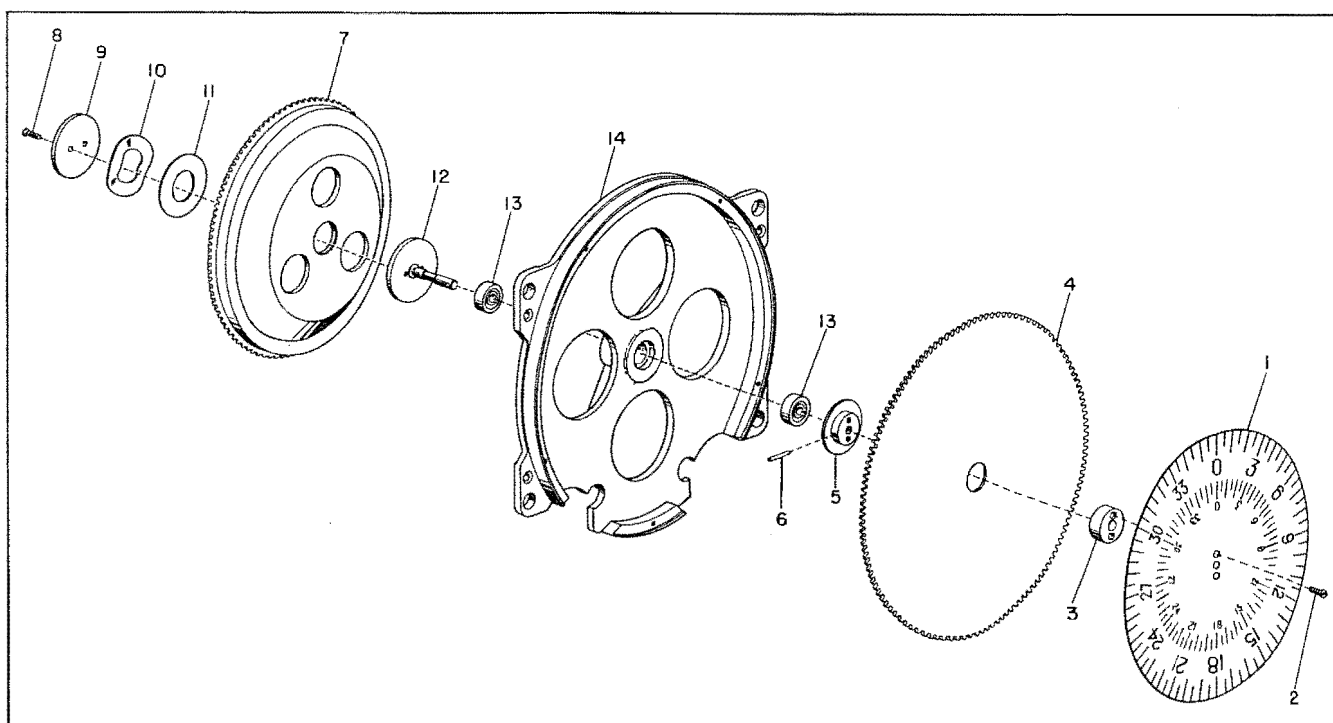
[illegible]

Figure 88. Dial Assembly

This exploded view diagram illustrates the assembly of a mechanical component, likely a door latch or lock mechanism. The components are numbered 1 through 16:

- 1:** A coiled spring.
- 2:** A small metal bracket or lever.
- 3:** A small screw or pin.
- 4:** A coiled spring.
- 5:** A small metal plate or bracket.
- 6:** A small screw or pin.
- 7:** A small metal plate or bracket.
- 8:** A large, circular metal ring with a flange.
- 9:** A small screw or pin.
- 10:** A small metal plate or bracket.
- 11:** A small screw or pin.
- 12:** A small metal plate or bracket.
- 13:** A large metal bracket or frame.
- 14:** A large metal ring with a flange.
- 15:** A small metal pin or bolt.
- 16:** The main base plate or housing.

The diagram shows the spatial relationship between these parts, indicating how they fit together to form the complete assembly.

Revised 1 July 1953

This exploded view diagram illustrates the assembly of a mechanical device, possibly a camera or projector. The components are labeled as follows:

- 1**: A small internal component, possibly a pin or screw, located within the main body.
- 2**: A circular flange or mounting plate with multiple screw holes.
- 3**: A small screw or pin used for assembly.
- 4**: A small washer or spacer.
- 5**: A circular lens element or filter.
- 6**: A circular component, likely a lens or filter, with a textured surface.
- 7**: A small circular component, possibly a spacer or seal.
- 8**: A small circular component, possibly a spacer or seal.
- 9**: A small circular component, possibly a spacer or seal.
- 10**: The main body of the device, featuring a large circular opening and various mounting points.
- 11**: A large, circular, gear-like component at the bottom of the main body.

The diagram shows the main body (10) with a large circular opening. A lens assembly (5, 6, 7, 8, 9) is shown being inserted into the top of the body. A mounting bracket (2) is shown being attached to the side of the body. A small internal component (1) is shown being inserted into the main body. A large, circular, gear-like component (11) is shown at the bottom of the main body. A small screw (3) and washer (4) are shown being used to secure the mounting bracket (2) to the main body (10).

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This exploded view diagram illustrates the assembly of a mechanical device, likely a pump or motor component. The central part is a cylindrical motor or pump housing (28). To its left is a circular flange or cover (19) with a central threaded port (24). To its right is a larger, more complex housing (29) with a circular opening. Various components are shown in their relative positions, indicated by dashed lines. The parts are numbered 1 through 29. Key components include: 1. A small rectangular plate (1) with a hole. 2. A small cylindrical pin (2). 3. A small rectangular plate (3) with a hole. 4. A small rectangular plate (4) with a hole. 5. A small cylindrical pin (5). 6. A small cylindrical pin (6). 7. A curved, C-shaped bracket (7). 8. A small cylindrical pin (8). 9. A small cylindrical pin (9). 10. A small rectangular plate (10) with a hole. 11. A small rectangular plate (11) with a hole. 12. A small cylindrical pin (12). 13. A small rectangular plate (13) with a hole. 14. A small rectangular plate (14) with a hole. 15. A circular flange or cover (15) with a central hole. 16. A circular flange or cover (16) with a central hole. 17. A small cylindrical pin (17). 18. A small cylindrical pin (18). 19. A circular flange or cover (19) with a central hole. 20. A small cylindrical pin (20). 21. A small cylindrical pin (21). 22. A small cylindrical pin (22). 23. A small cylindrical pin (23). 24. A central threaded port (24). 25. A small rectangular plate (25) with a hole. 26. A small cylindrical pin (26). 27. A small cylindrical pin (27). 28. A cylindrical motor or pump housing (28). 29. A larger, more complex housing (29) with a circular opening.

Revised 1 July 1953

SECTION IX - GROUP ASSEMBLY PARTS LIST

FIG. NO.	INDEX NO.	SYMBOL	GROUP AIRCRAFT INSTRUMENTS						UNITS PER ASS'Y.	PROPERTY CLASSIFICATION																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																													
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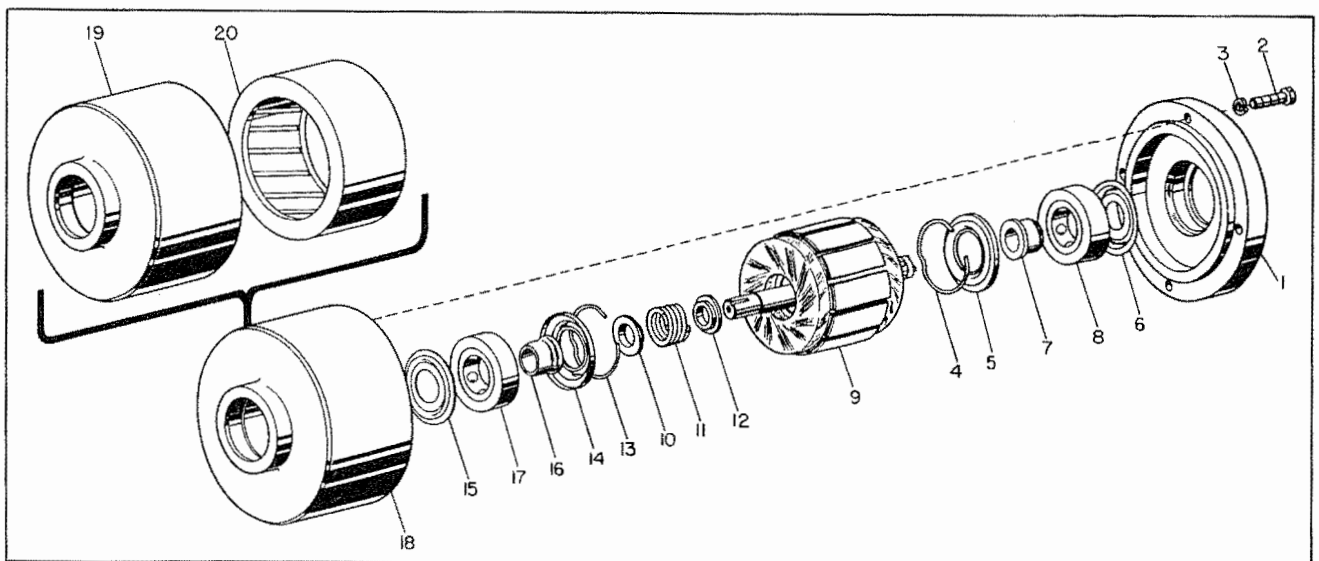


Figure 92. Rotor Assembly

[illegible]

SECTION IX—GROUP ASSEMBLY PARTS LIST

FIG. NO.	INDEX NO.	SYMBOL	GROUP AIRCRAFT INSTRUMENTS						UNITS PER ASSY.	PROPERTY CLASSIFICATION	
			MAJOR ASSEMBLY DIRECTIONAL GYRO INDICATOR, R88I1006-020-000							U. S. NAVY	U. S. ARMY
			PART NUMBER	1	2	3	4	5			

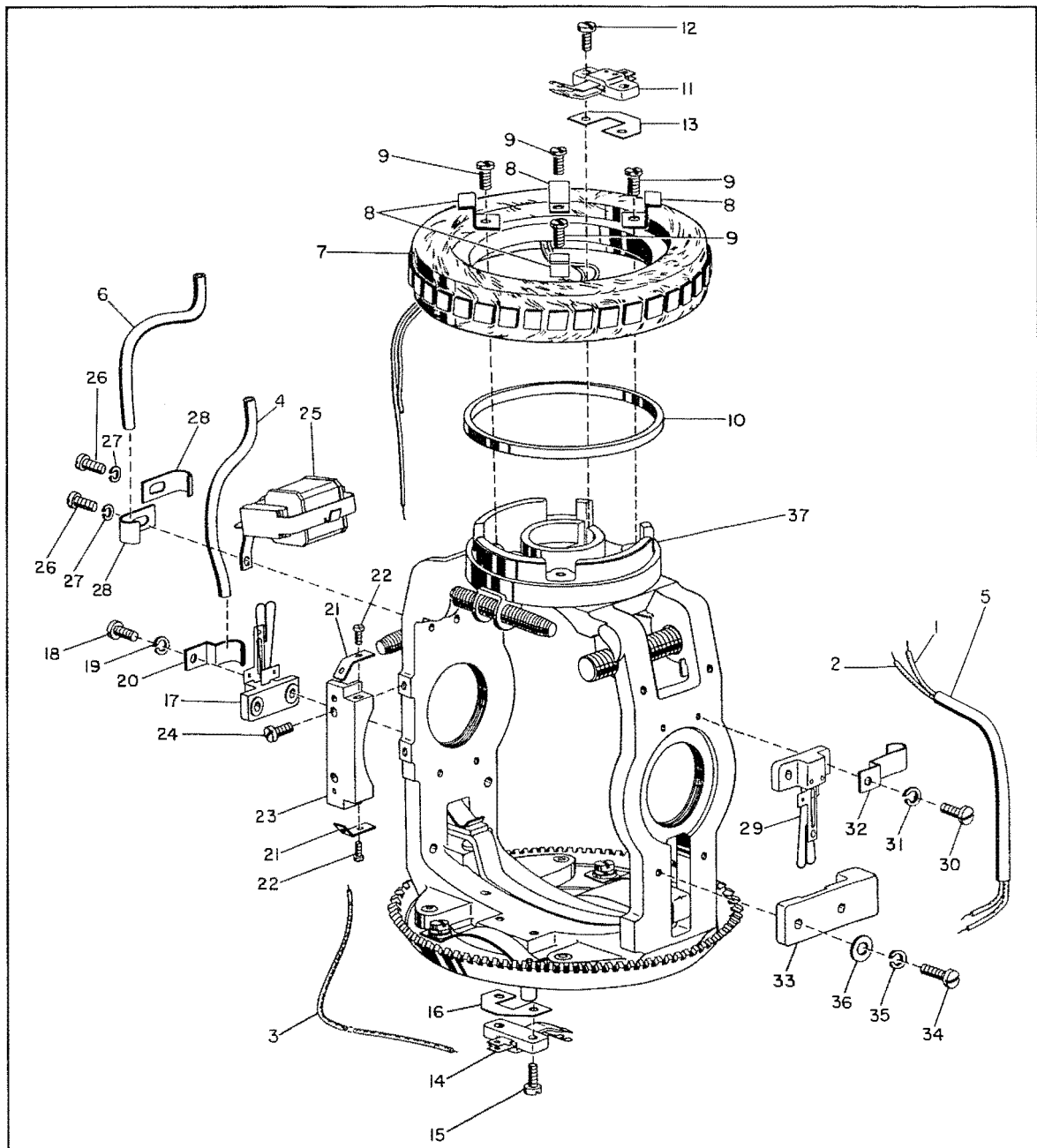


Figure 93. Ring and Stator Assembly

This technical drawing is an exploded view of a mechanical assembly, showing the relationship between various components. The central part is a large, cast housing (27) with two large circular ports. The assembly includes various fasteners and structural parts, numbered 1 through 27. The diagram uses dashed lines to show the alignment and assembly sequence of the parts.

Key components and their assembly sequence (from top to bottom):

- Top Section:** Components 1, 2, 3, 4, and 5 are shown at the top, likely forming a cover or inlet/outlet assembly.
- Internal Components:** Parts 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, and 26 are shown in the middle and bottom sections, representing internal mechanisms and fasteners.
- Bottom Section:** Components 25 and 26 are shown at the bottom, likely forming a base or outlet assembly.

The diagram is a technical drawing with dashed lines indicating the assembly path.

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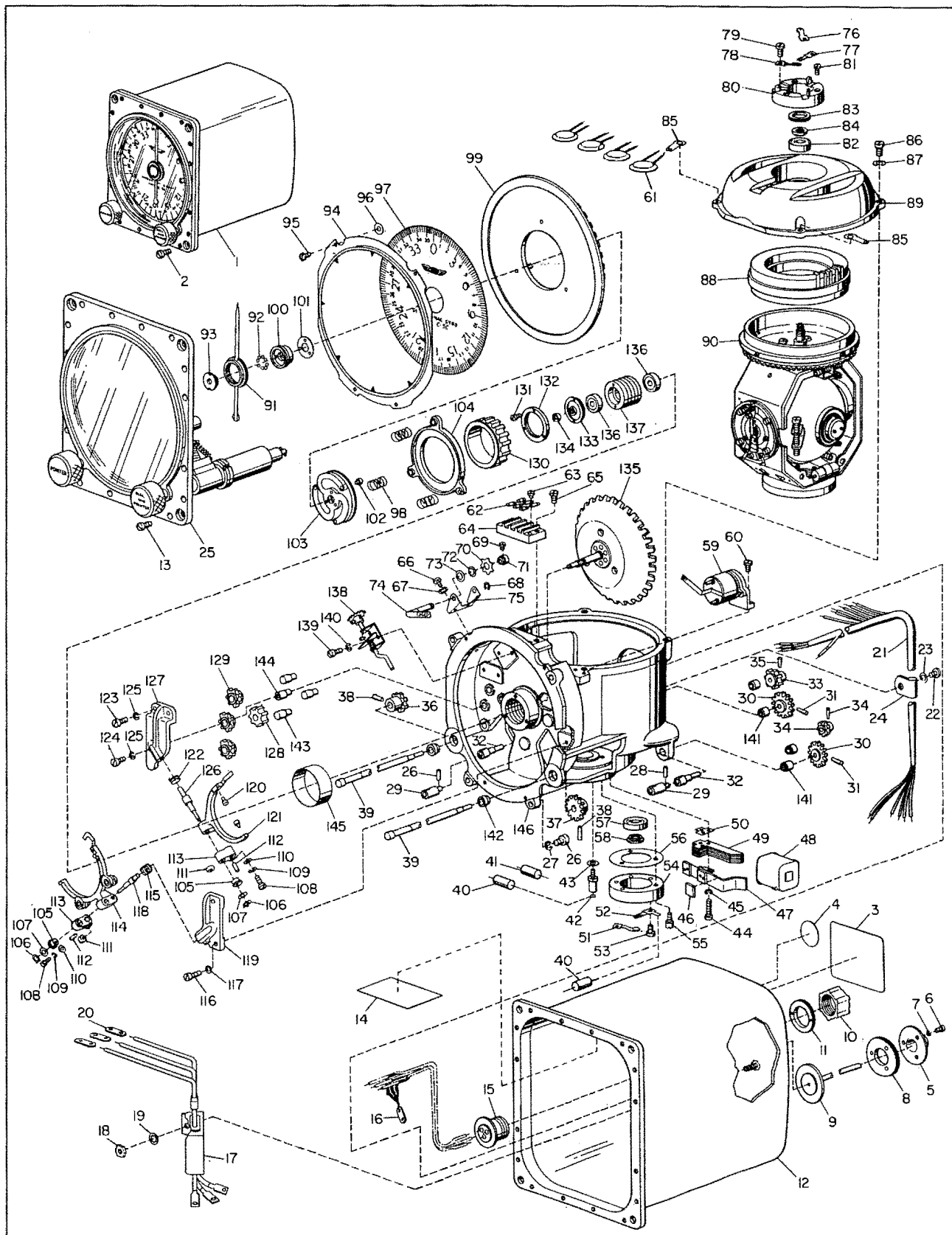


Figure 95. C-5C Directional Gyro Indicator Assembly

FIG. NO.	INDEX NO.	GROUP	AIRCRAFT INSTRUMENTS						UNITS PER ASSY.	PROPERTY CLASSIFICATION		
			MAJOR ASSEMBLY	DIRECTIONAL GYRO INDICATOR, TYPE C-5C						U. S. NAVY	U. S. ARMY	
				PART NUMBER	1	2	3	4				5

SECTION IX- GROUP ASSEMBLY PARTS LIST

[illegible]

SECTION IX- GROUP ASSEMBLY PARTS LIST

FIG. NO.	INDEX NO.	SYMBOL	GROUP AIRCRAFT INSTRUMENTS						UNITS PER ASS'Y.	PROPERTY CLASSIFICATION		
			MAJOR ASSEMBLY DIRECTIONAL GYRO INDICATOR, TYPE C-5C							U. S. NAVY	U. S. ARMY	
			PART NUMBER	1	2	3	4	5	6			NOMENCLATURE
									FRONT BEZEL ASSEMBLY			
96	-		678495						Bezel Assy - Front (see fig. 95-24 for next higher assy)	Ref		
	1		854577						Knob - Luminescent	1		
	2		854573						Knob - Luminescent	1		
	3		0495-17						ATTACHING PARTS Rollpin (EN)	2		
	4		844692						Glass - Bezel	1		
	5		845584						Spring - Extension	2		
	6		847414						Head - Lever	2		
	7		718038						Bellows (special requirements on FS Part No. BE-1047H10-14)	2		
96	-		314544						Lever and Roller Assy	2		
	8		0450-014						ATTACHING PARTS Pin - Straight 1/16 dia x 1/4 in. CRES	2		
	9		314418						Roller - Lever	2		
	10		0450-007						ATTACHING PARTS Pin - Straight 3/64 dia x 3/16 in. CRES	2		
	11		844749						Arm - Lever	2		
	12		0450-015						Pin - Straight 1/16 dia x 5/16 in. CRES	2		
	13		844759						Sleeve	2		
	14		844761						ATTACHING PARTS Nut - Lock	2		
	15		844750						Shaft	2		
96	-		844920						Shaft Assy - Wobble	2		
	16		844751						Sleeve - Shaft	2		
	17		718038						Bellows (special requirements on FS Part No. BE-1047H10-14)	2		
	18		844921						Shaft - Wobble	2		
	19		844752						Bushing - Shaft	2		
96	-		847520						Shaft Assy	2		
	20		317270						Sleeve - Shaft	2		

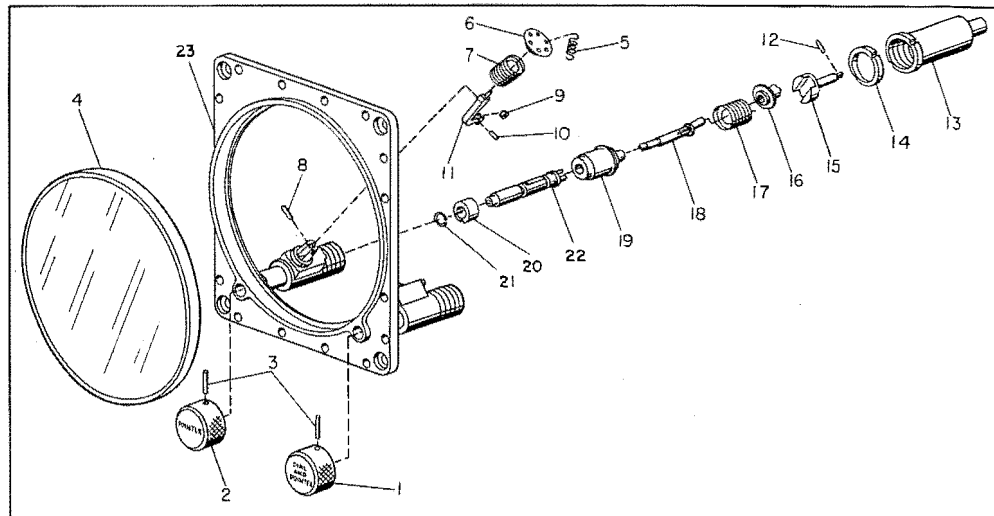


Figure 96. Front Bezel Assembly

SECTION IX- GROUP ASSEMBLY PARTS LIST

FIG. NO.	INDEX NO.	SYMBOL	GROUP AIRCRAFT INSTRUMENTS							UNITS PER ASS'Y.	PROPERTY CLASSIFICATION			
			MAJOR ASSEMBLY DIRECTIONAL GYRO INDICATOR, TYPE C-5C								U. S. NAVY	U. S. ARMY		
			PART NUMBER	1	2	3	4	5	6				NOMENCLATURE	
98	8		319090							GYRO AND GIMBAL ASSEMBLY (cont)				
	9		0406-280							Nut - Hex .164 in. -32 CRES			AR	
	10		319556							Screw - Fil h .164 -32 NC-3 x 7/8 in. CRES			2	
	11		302793							Contact - Electrical			1	
	12		318611							ATTACHING PART				
	13		836465-2							Screw - Fil h .060-80 x 3/32 in. CRES			1	
	14		Com1							:				
	15		101							Shim - Holder			AR	
	16		302793							Holder - Contact			1	
	17		318615							ATTACHING PART				
18		836454-1							Screw - Binding hd .086-64 x 5/16 in. CRES (AXS) (Sperry Part No. 0453-080)			1		
									:					
									Terminal - Soldering (ZE) (Sperry Part No. 155143)			2		
									ATTACHING PARTS			2		
									Screw - Fil h .060-80 x 3/32 in. CRES			2		
									:					
									Shim - Brush			AR		
									Brush - Electrical			1		

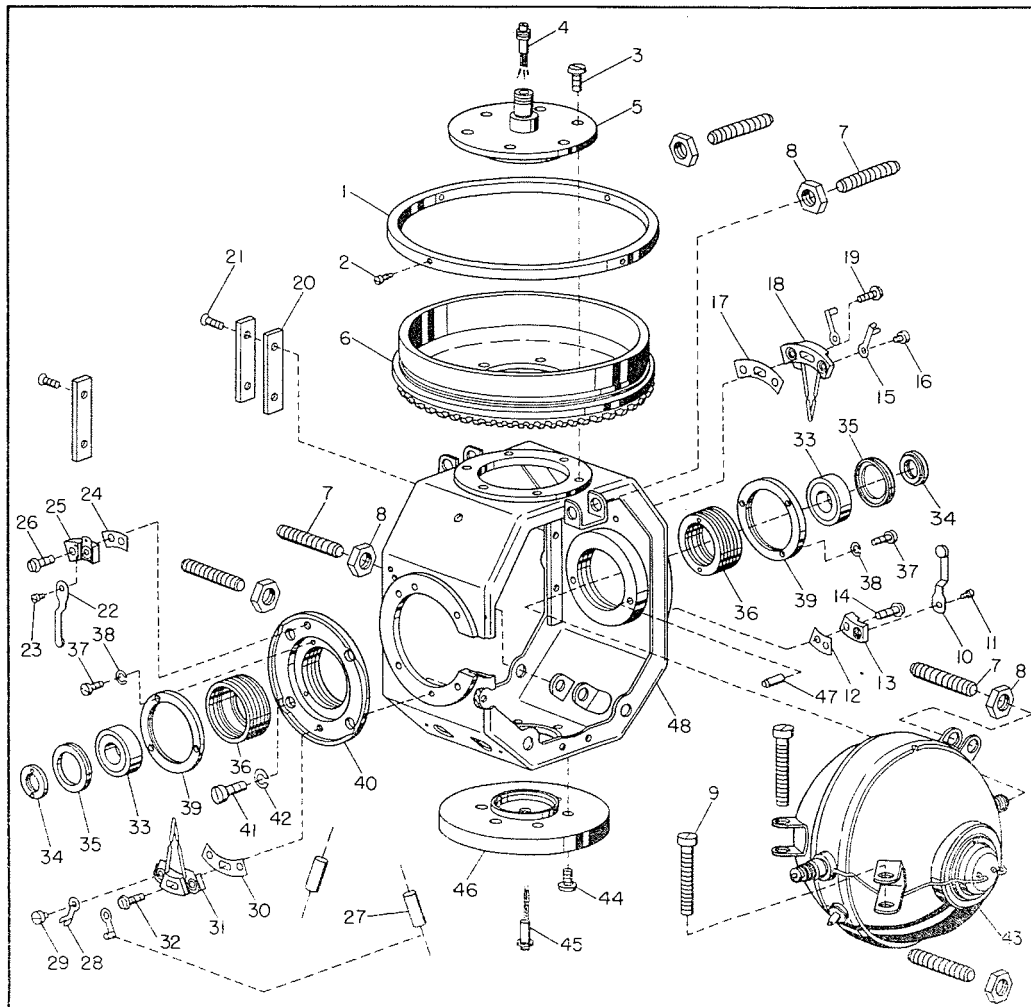
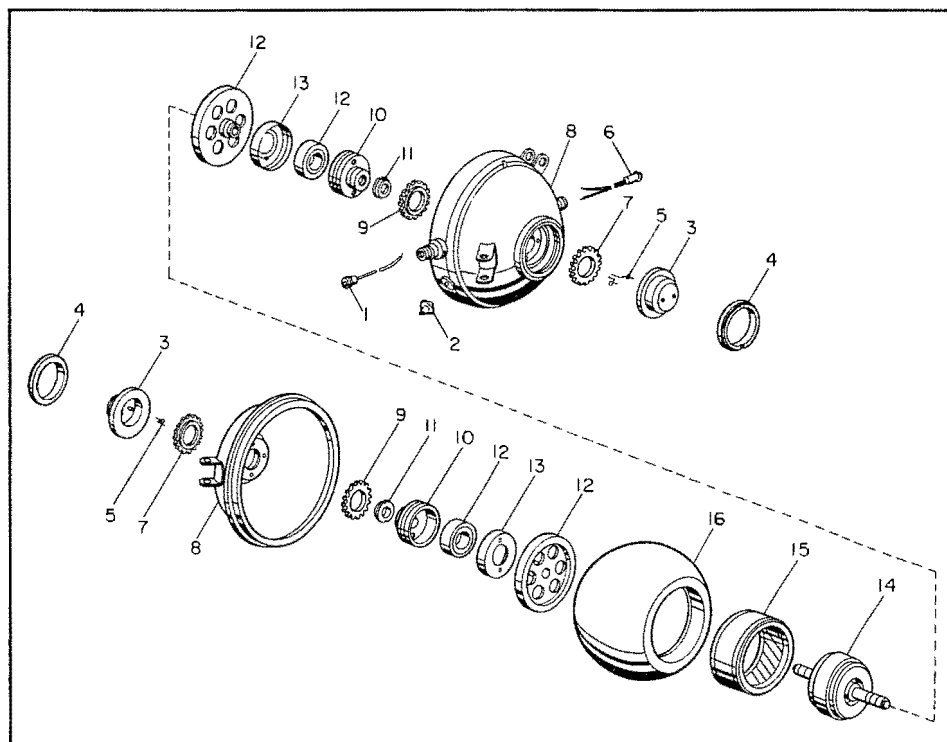


Figure 98. Gyro and Gimbal Assembly

SECTION IX- GROUP ASSEMBLY PARTS LIST

FIG. NO.	INDEX NO.	GROUP	AIRCRAFT INSTRUMENTS						UNITS PER ASS'Y.	PROPERTY CLASSIFICATION	
			MAJOR ASSEMBLY DIRECTIONAL GYRO INDICATOR, TYPE C-5C							U. S. NAVY	U. S. ARMY
			PART NUMBER	1	2	3	4	5	6		
98-	19	ComL							GYRO AND GIMBAL ASSEMBLY (cont)		
			ATTACHING PART								
			Screw						- Binding hd .086-64 x 5/16 in. CRES (AXS) (Sperry Part No. 0453-080)	1	
	20	856655							Weight - Balance	AR	
	21	ComL	ATTACHING PARTS								
			Screw						- Binding hd .099-56 x 1/8 in. CRES (AXS) (Sperry Part No. 0453-106)	AR	
	21	ComL	Screw						- Binding hd .099-56 x 3/16 in. CRES (AXS) (Sperry Part No. 0453-108)	AR	
	22	309556							Contact - Electrical	1	
			ATTACHING PART								
	23	302793	Screw						- Fil h .060-80 x 3/32 in. CRES	1	
	24	318611							Shim - Holder	AR	
	25	836465-3							Holder - Contact	1	
			ATTACHING PART								
	26	ComL	Screw						- Binding hd .086-64 x 5/16 in. CRES (AXS) (Sperry Part No. 0453-080)	1	
	27	RC20BF102J							Resistor - Fixed molded composition 1000 ohms \pm 5% 1/2 w (Sperry Part No. 069-49)	2	
	28	101							Terminal - Soldering (ZE) (Sperry Part No. 155143)	2	
			ATTACHING PARTS								
	29	302793	Screw						- Fil h .060-80 x 3/32 in. CRES	2	
	30	318615							Shim - Brush	AR	
	31	836451-2							Brush - Electrical	1	
			ATTACHING PART								
	32	ComL	Screw						- Binding hd .086-64 x 5/16 in. CRES (AXS) (Sperry Part No. 0453-080)	1	
	33	SR4DXR5366J							Bearing - Ball (ND) (Sperry Part No. 0379-3)	2	
			ATTACHING PARTS								
	34	833929	Nut						- Bearing lock	2	
	35	833927	Nut						- Bearing lock	2	
	36	833928							Adapter - Bearing	2	
			ATTACHING PARTS								
	37	0406-046	Screw						- Fil h .073-72 NF-3 x 1/4 in. CRES	6	
	38	ComL	Washer						- Med spring lock for .073 in. screw (EM) (Sperry Part No. 204450)	6	
	39	314045							Nut - Adjusting	2	
	40	718067							Adapter - Bearing	1	
			ATTACHING PARTS								
	41	0406-146	Screw						- Fil h .112-48 NF-3 x 3/16 in. CRES	4	
	42	AN935-4	Washer						- Med spring lock for .112 in. screw	4	
98	43	676210							Gyro Unit Assy (see fig. 99 for breakdown)	1	
	-	844694							Trunnion Assy - Lower	1	
		ATTACHING PARTS									
44	ComL	Screw						- Binding hd .112-48 x 3/16 in. CRES (AXS) (Sperry Part No. 0453-146)	6		
45	833891							Ring - Slip	1		
46	842986							Trunnion - Lower	1		
98	-	844091						Vertical Gimbal and Pin Assy	1		
	47	307168						Pin - Stop	2		
48	676538							Gimbal - Vertical	1		



SECTION X - NUMERICAL PARTS LIST

PART NUMBER	FIGURE & INDEX NUMBER	TOTAL QUANTITY	PART NUMBER	FIGURE & INDEX NUMBER	TOTAL QUANTITY	PART NUMBER	FIGURE & INDEX NUMBER	TOTAL QUANTITY
Ball	95-92	8	P690138 (cont)	57-19		0406-046 (cont)	98-37	
Cable	93-1	1		62-4		0406-060	95-66	8
Cable	93-2	1		62-5			95-95	
Cable	93-3	1		62-6			95-139	
Screw .086-56	95-63	10		65-22		0406-063	97-2	2
x 3/16				65-23		0406-068	95-44	3
Screw .086-56	95-60	5		65-24		0406-069	95-139	2
x 1/4				69		0406-074	95-53	2
Screw .086-56	95-81	3		69-15		0406-075	83-12	4
x 3/8				69-16			83-15	
Screw .086-64	95-6	3		69-17			91-12	
x 1/8				74-4		0406-076	75-38	27
Screw .086-64	93-24	2		74-5			75-40	
x 3/16				74-6			75-42	
Screw .086-64	98-14	4	P69843	50,54,	2		80-6	
x 5/16				56,65			83-21	
Screw .099-56	98-21	AR		68			84-12	
x 1/8			Q36B	82-6	1		84-15	
Screw .099-56	86-50	9		82-12			84-26	
x 3/16	93-9		Q36BX5145E	82-5	2		85-21	
	94-2			82-11			85-28	
Screw .099-56	95-65	4	RC20BF102J	98-27	1		86-30	
x 7/16			RC20BF111J	95-41	1		86-32	
Screw .112-40	95-22	1	RC20BF201J	95-40	2		86-34	
x 3/16			R2X1228U	48-23	2		89-6	
Screw .112-48	98-44	6		60-23			90-3	
x 3/16				72-2			93-12	
Screw .112-48	98-3	6	R2X1513W	78-21	2		93-15	
x 1/4			R4	52-34	4		94-8	
Screw .164-32	98-7	6		53-6			94-17	
x 1				63-26			94-22	
Sleeve	93-4	1		64-6			95-79	
Sleeve	93-5	1	R4X1228U	48-78	4	0406-077	81-14	6
Sleeve	93-6	1		49-78			91-2	
Washer .073	98-38	6	SP36	51-113	2		91-26	
Washer .086	86-35	6	SR3DXR5366J	95-136	2	0406-078	80-2	11
Washer .086	91-6	13	SR4DXR5366J	95-57	4		81-4	
	91-9			95-82			83-18	
	91-21			98-33			84-18	
	91-27		SR4X1378W	75-47	4		84-30	
	92-3			80-11			91-5	
Washer .112	86-5	23	S1003	51-137	1		91-8	
	86-9		S1004	51-138	1		91-20	
	86-15		S3129	55-3	4		93-26	
	86-43			66-3		0406-080	84-34	6
	86-48			85-26			93-18	
	86-58			94-26			93-30	
Washer .164	86-22	4	XSC115	96-21	2		93-34	
H149	48	2	0170-2	63	1	0406-082	81-7	4
MILCK63Y103Z	95-61	4	0185-2	75-17	2		91-4	
MTS12	95-42	3		86-19		0406-083	77-11	3
PK45F2-3	79-9	9	0188-3	50-96	3		87-11	
	84-9			95-43		0406-099	95-106	2
	85-2		0188-5	48-77	7	0406-114	92-2	4
	89-9		0202-201020	63-28	2	0406-126	95-124	1
	94-9		0404-008	95-38	2	0406-128	95-123	2
	95-2		0404-149	95-31	4	0406-130	95-116	2
P55061	58,68	3		95-35		0406-146	98-41	4
P690120	50,54,	4	0406-015	84-22	3	0406-148	75-66	4
	65			93-22			86-57	
P690138	54-22	11		95-102		0406-150	75-56	4
	54-23		0406-016	95-131	3		86-47	
	54-24		0406-019	95-69	3	0406-152	75-7	9
	57			100-1			75-13	
	57-17		0406-042	100-7			86-8	
	57-18		0406-046	78-11	5		86-14	
				91-22	6	0406-154	75-60	4

SECTION X - NUMERICAL PARTS LIST

PART NUMBER	FIGURE & INDEX NUMBER	TOTAL QUANTITY	PART NUMBER	FIGURE & INDEX NUMBER	TOTAL QUANTITY	PART NUMBER	FIGURE & INDEX NUMBER	TOTAL QUANTITY
0406-225	95-86	4	193159 (cont)	59-4		199314 (cont)	57-13	
0405-277	75-19	4		63-10			69-11	
	86-21		195471	50-93	4		83-9	
	95-26		196520	61-11	2	199315	50-107	4
0406-280	98-9	2		73-9			51-107	
0407-078	75-29	6	199270	50-105	4		54, 57,	
0410-015	77-36	6		54-3		199316	65, 69	
	88-8		199276	65-3	1		50, 51,	4
	91-7			51, 56,			54, 57,	
0410-016	81-10	1	199277	68	1	199317	65, 69	
0410-017	78-16	3		51, 56,			50, 51,	4
	81-7		199278	68			54, 57,	
	88-8			51-110	1	199318	65, 69	
0410-019	81-2	2		56			50-103	2
0410-020	88-2	2		68-2			55-20	
0410-044	75-10	8		82-19			66-20	
	86-11			92-20			85-7	
0410-076	83-8	3	199279	51-114	2		94-3	
	91-17		199280	50-108	4	199319	50-102	2
0410-078	75-36	6		51-108			55-19	
	86-28			54-9			66-19	
0424-008	95-18	1		57-5			85-4	
0425-007	95-14	1		65-9			94-4	
0450-003	95-135	4		69-3		199321	51	1
0450-007	77-37	12		83-13		199323	50	2
	96-10			83-16			55-18	
0450-008	95-112	4		84-13			66-18	
0450-009	95-110	2		84-16			85-5	
0450-014	96-8	2		91-13			94-1	
0450-015	95-28	4		93-13		199347	48, 49,	4
	96-12			93-16			52, 54,	
0456-150	86-4	2	199281	51, 56,	1		63, 65	
0495-017	96-3	2		68		199348	48, 49	4
101	92-28	4	199282	51, 56,	1	199349	48, 49,	4
	98-15			68			52, 54,	
158369	48-80	3	199283	51-115	1		63, 65	
	52-36		199288	51-134	1	199350	48, 49	4
	75-3			58-1		199351	48, 49	4
	86-4			70-1		199352	48, 49	4
1604-178	75-16	1		81-12		199353	51-138	4
	86-18			91-24			58-11	
	95-10		199289	49, 50,	2		70-9	
162006	51, 56,	50		52, 53,			81-13	
	68			64, 65			91-1	
162007	51, 56,	2	199290	49, 50,	4	199354	51-139	2
	68			52, 53,			58-12	
162009	51-116	1		64, 65			70-10	
	56		199291	51-135	1		81-15	
	68-7			58-3			91-3	
	82-16			70-3		199355	51-109	1
	92-11			91-23			56	
162012	51, 56,	42	199292	49-90	4		68-1	
	68			50-90		199357	56, 68	1
162056	51, 56,	4		52-42		199361	50-95	2
	68			53-2			55-5	
170934	56	2		64-2			66-5	
1775109	95-17	1		65-27			85-20	
186026	49-86	2	199293	49, 50,	4		94-16	
	54-21			52, 53,		199362	50-94	2
	65-21			64, 65			55-4	
189322	77-9	1	199294	49, 50,	4		66-4	
	87-9			52, 53,			85-24	
19	51	1		64, 65			94-20	
193159	48-20	12	199295	51-120	2	199363	48-3	4
	50-20			57-2			49-3	
	52-10			58-6			52-40	
	54-4		199314	51-126	1		53-8	
	55-21							

SECTION X - NUMERICAL PARTS LIST

PART NUMBER	FIGURE & INDEX NUMBER	TOTAL QUANTITY	PART NUMBER	FIGURE & INDEX NUMBER	TOTAL QUANTITY	PART NUMBER	FIGURE & INDEX NUMBER	TOTAL QUANTITY
199363 (cont)	63-32		199433	50, 54,	50	199505	48-49	1
	64-8			65			52-19	
	75-44		199434	50-100	2	199506	48-52	1
	80-8			55-16			52-23	
	86-36			66-16		199507	48-59	1
	90-5			85-15			52-28	
199364	50-97	1		94-11		199508	48-60	2
199365	48-4	4	199435	88-13	2		61-12	
	49-4		199436	50, 54,	1	199509	48-55	1
	52, 54,			65			61-14	
	63, 65		199440	50, 54,	1	199510	48-57	1
199366	51, 57,	3		65			52-26	
	69		199441	50, 54,	1	199511	48-61	2
199367	51-101	1		65		199512	48-63	2
	55-17		199448	48-30	1		61-16	
	66-17			60-8			73-13	
	85-7			72-8		199515	48-65	1
	94-7	199	199449	48-24	1	61-18	61-18	
199368	50-98	1		60-17			73-15	
	55-14			72-14			77-17	
	66-14		199450	48-35	1		87-17	
	85-14			60-13		199517	48	1
	94-10			72-11		199518	48	1
199369	51-124	1	199451	48-28	1		52-55	
	57-9			60-6		199519	48	1
	69-7			72-6			61-15	
	91-7		199452	48-25	2		73-12	
199372	51, 56,	1		60-3		199529	48-54	1
	68			72-3			52-25	
199378	51-121	2	199453	48-33	1	199530	48-58	1
199379	51-122	2		60-11			52-27	
	57-3		199454	48-27	2	199546	48, 52	1
	58-7			60-5		199575	48-7	3
199380	51-125	1		72-5			59-3	
	57-12		199455	48-36	1		71-3	
	69-10			60-14			79-10	
199381	51-123	1	199471	48-39	1		89-10	
	57, 69			61-2		199576	48-12	1
199382	57, 69	1		73-2		199577	48-11	2
199383	57-16	1	199472	48-42	2		59-6	
	69-14			61-5			71-6	
	91-15			73-5			79-12	
199384	49, 54,	2	199473	48-51	2		89-12	
	65			52-21		199578	48, 59,	1
199385	51, 57,	1		63-20			71	
	69			75-22		199579	48-13	1
199386	49-82	2		75-31			59-8	
	54-19			86-24			71-8	
	65-19		199474	48-44	1		79-3	
	84-23			61-7			89-3	
	93-23		199475	48, 52,	18	199581	48, 59,	1
199387	49-84	2		63			71	
	54-18		199476	48-19	3	199582	48	1
	65-18		199477	48-38	1	199583	58, 71	2
	84-21			61-1		199591	48-62	1
	93-21			73-1			52-29	
199388	49-83	2	199493	48-43	2		63-21	
	53-9			61-6			75-24	
	64-9			73-6			86-26	
	80-4		199494	48-41	6	199659	48-53	1
	90-1			61-4			52-24	
199389	49	1		73-4		2FF	95-24	1
199393	51, 57,	1	199503	48-64	1	201127	48	1
	69			61-17		201221	50, 54,	1
199432	50-99	1		73-14			65	
	55-15		199504	48-50	1	205596	86-39	2
	66-15			52-20			90-8	
	85-16			63-19				
	94-12							

SECTION X - NUMERICAL PARTS LIST

PART NUMBER	FIGURE & INDEX NUMBER	TOTAL QUANTITY	PART NUMBER	FIGURE & INDEX NUMBER	TOTAL QUANTITY	PART NUMBER	FIGURE & INDEX NUMBER	TOTAL QUANTITY
205656	86-55	1	210368 (cont)	91		232890 (cont)	63-34	
209333	48	1	210369	58-9	1		64-10	
209392	51-130	1		70-7			75-46	
209393	51-132	1		91-19			80-10	
209394	51-131	1	210701	52-9	3		86-38	
209395	51-129	1		63-9			90-7	
209396	51-133	1	210916	56	3	233664	85-25	1
209483	48-76	1	210976	68	3	233665	85-27	1
209484	48-75	1	211064	57,69	1		94-21	
209485	48-74	1	211509	58-2	1	233669	84-28	2
209522	49-87	1		70-2			93-28	
209541	49-88	1		91		233997	60-16	1
209542	49-89	1	211542	55-9	1		72-13	
209795	48-52	1		66-9		234090	75-39	2
209925	48-37	2		94-5			84-29	
	60-15		211543	55-10	1		86-31	
	72-112			66-10			93-29	
	78-14			94-6		234179	75-60	3
	88-6		224263	61-10	2		86-51	
209982	48,52,	1		73-8		234262	54-15	1
	63		224361	59-11	1		65-15	
209983	48,52,	1		71-11		234263	52-46	2
	63			79-13			54-14	
209984	48,52,	1		89-13			63-36	
	63		224402	59-7	1		65-14	
209985	48,52,	1		59-15		234264	52-45	1
	63			71-7			63-35	
209986	48,52,	1		71-15		234294	52-11	6
	63			79-1			59-16	
209987	48,52,	1		79-4			63-11	
	63			89-1			71-16	
209988	48,52,	1		89-4			75-61	
	63		224412	59	2		79-15	
209989	48,52,	1		54-12			86-52	
	63			71			89-15	
209990	48,52,	1		71-12		234300	54-16	1
	63			79-5			65-16	
210027	48,59,	1		89-5		234303	57-7	1
	71		224577	77-29	2		69-5	
210028	48-14	1		87-29		234380	84-17	1
	59-9		225957	52-38	1		93-17	
	71-9			63-30		234536	59,71	1
	79-2			75-52		234537	59-10	1
	89-2			86-44			71-10	
210032	48-81	1	230090	65-4	9		79-14	
	52-37			66-21			89-14	
	63-29			71-4		234542	75-23	1
	75-2		230893	85-3	1		86-25	
	86-3		232115	56	2	234611	84-8	4
210361	54-10	2		68-6			93-8	
	57-4			82-15		234748	78-20	1
	65-10			82-17			88-12	
	69-2			92-10		234749	78-18	1
210362	57-8	1		92-12			88-10	
	69-6		232210	55-11	1	234753	78-17	1
210363	57-15	AR		66-11			88-9	
	69-13			85-19		234826	60-18	1
	91-4			94-15			72-15	
210366	54-11	1	232211	55-12	2		78-19	
	65-11			66-12			88-11	
210367	54-12	1		85-17		234839	78-3	1
	65-12			94-13		234840	83-10	2
	85-33		232511	77-26	2		91-14	
	93-33			86-16		234841	83-14	2
210368	58-8	1		87-26			84-11	
	70-6		232890	52-44	4		91-10	
	81-6			53-10			93-11	

VERTICAL GIMBAL & GYRO ASSY NO. 649552-H

INDEX NO.	TITLE
B	VERTICAL RING & TORQUE MOTOR ASSEMBLY
C	GYRO UNIT ASSEMBLY

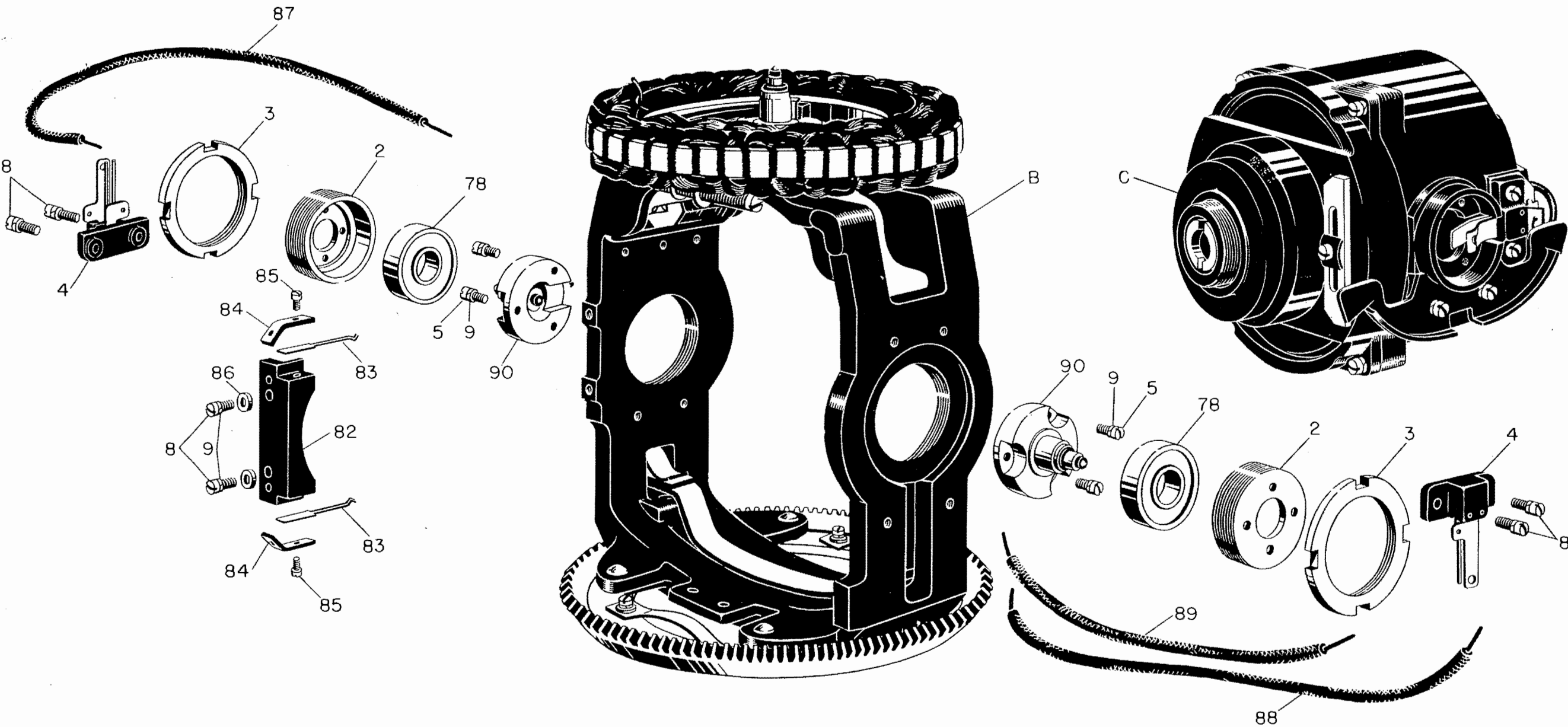


Figure 49

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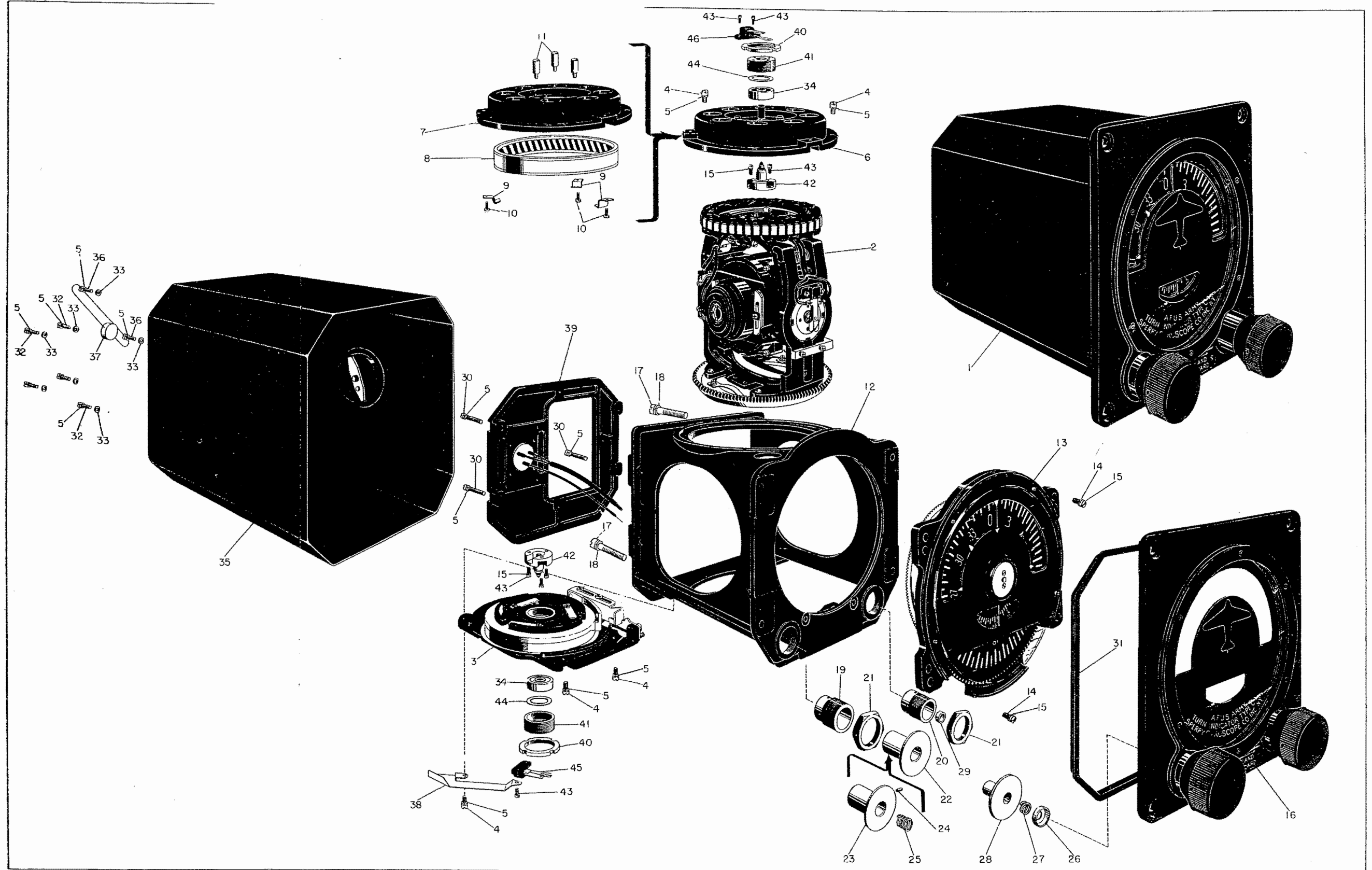


Figure 52 - Directional Gyro Indicator Assy

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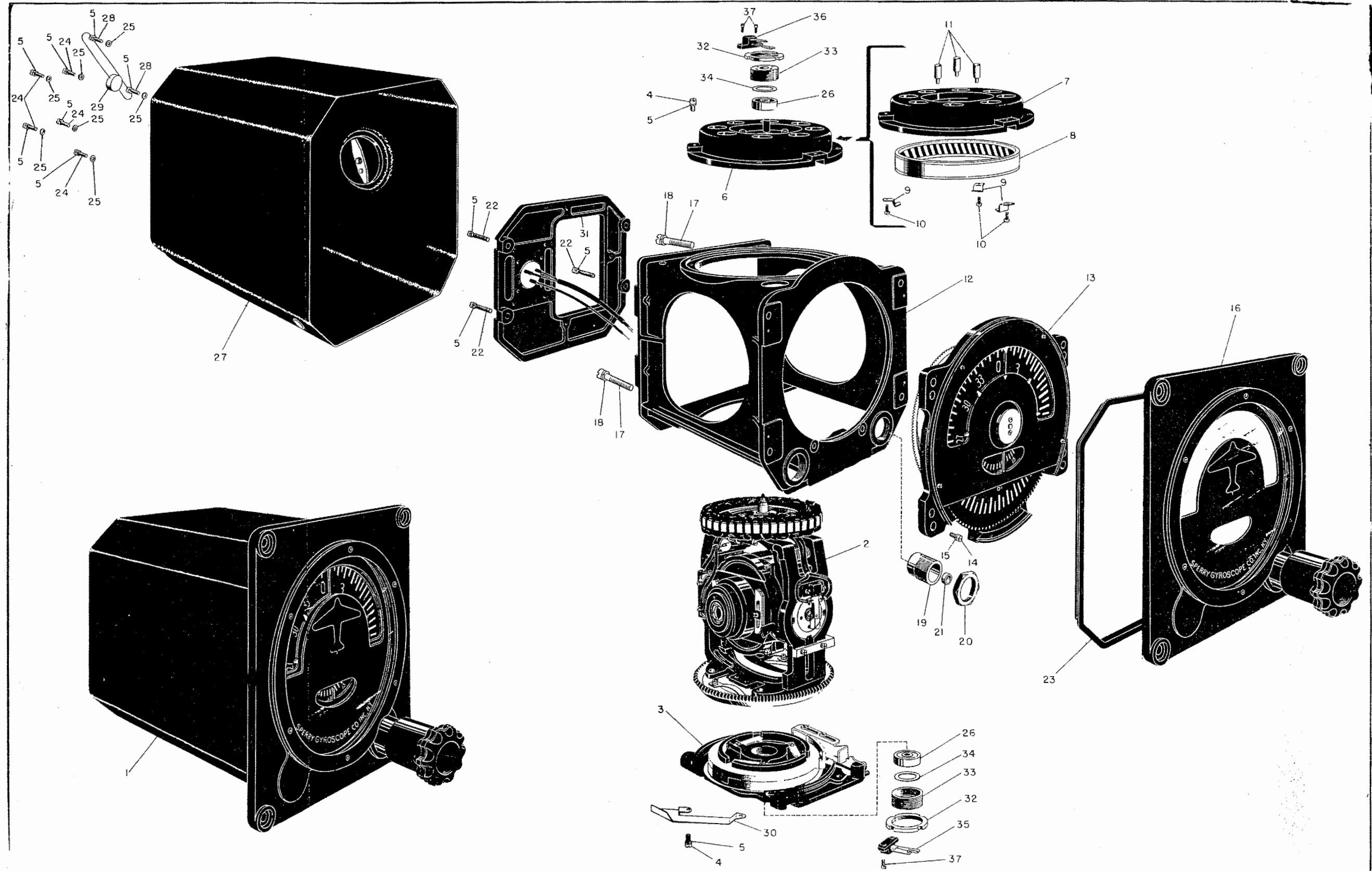


Figure 63 - Directional Gyro Indicator Assy

SECTION IX - GROUP ASSEMBLY PARTS LIST

FIG. NO.	INDEX NO.	GROUP	AIRCRAFT INSTRUMENTS						UNITS PER ASSY.	PROPERTY CLASSIFICATION	
			MAJOR ASSEMBLY DIRECTIONAL GYRO INDICATOR, TYPE C-5							U. S. NAVY	U. S. ARMY
			PART NUMBER	1	2	3	4	5			
			TYPE C-5 DIRECTIONAL GYRO INDICATOR ASSEMBLY								
75	1	652191	Indicator Assy - Directional gyro, type C-5							1	
75	2	210032	Seal - Lead							1	
			ATTACHING PARTS								
75	3	158369	Screw - Fil h							2	
75	4	AN935-4	Washer - Medium spring lock for .112 in. screw							2	
75	5	AN960C4	Washer - Plain							2	
			-----*								
75	6	822833	Cover Assy (see figure 76 for breakdown)							1	
			ATTACHING PARTS								
75	7	0406-152	Screw - Fil h .112-48NF-3 x 3/8 in. corrosion res steel							5	
75	8	AN935-4	Washer - Medium spring lock for .112 in. screw							5	
75	9	AN960C4	Washer - Plain							5	
75	10	0410-044	Screw - Flat hd .073-72NF-3 x 3/16 in. corrosion res steel							8	
			-----*								
75	11	824846	Gasket							1	
75	12	823052	Harness Assy - Wiring							1	
			ATTACHING PARTS								
75	13	0406-152	Screw - Fil h .112-48NF-3 x 3/8 in. corrosion res steel							4	
75	14	AN935-4	Washer - Medium spring lock for .112 in. screw							4	
			-----*								
75	15	AN3102-10SL3P	Receptacle (Sperry Part No. 194678)							1	
75	16	1604-178	Cover - Receptacle (WD) (Sperry Part No. 0186-2)							1	
75	17	0185-2	Gasket - Receptacle							1	
75	18	652409	Panel Assy - Front (see figure 77 for breakdown)							1	
			ATTACHING PARTS								
75	19	0406-277	Screw - Fil h .164-32NC-3 x 9/16 in. corrosion res steel							4	
75	20	AN935-8	Washer - Medium spring lock for .164 in. screw							4	
			-----*								
75	21	823481	Ring - Sealing							1	
75	22	199473	Nut - Hexagon							1	
75	23	234542	Bushing							1	
75	24	199591	Spacer							1	
75	25	284895	Flag - Luminescent							1	
			ATTACHING PART								
75	26	AN345C3	Nut - Hexagon .099 in.-56 corrosion res steel							1	
			-----*								
75	27	288325	Screw - Shoulder							1	
75	28	288329	Arm							2	
			ATTACHING PARTS								
75	29	0407-078	Screw - Fil h .086-64NF-3 x 1/4 in. corrosion res steel							2	
			-----*								
75	30	833573	Spring							1	
75	31	199473	Nut - Hexagon							1	
75	32	5100-12	Ring - Retaining (WKI) (Sperry Part No. 0183-3)							2	
75	33	288328	Bushing							1	
75	34	288327	Shaft							1	
75	35	652408	Dial Assy (see figure 78 for breakdown)							1	
			ATTACHING PARTS								
75	36	0410-078	Screw - Flat hd, .086-64 NF-3 x 1/4 in. corrosion res steel							4	
			-----*								

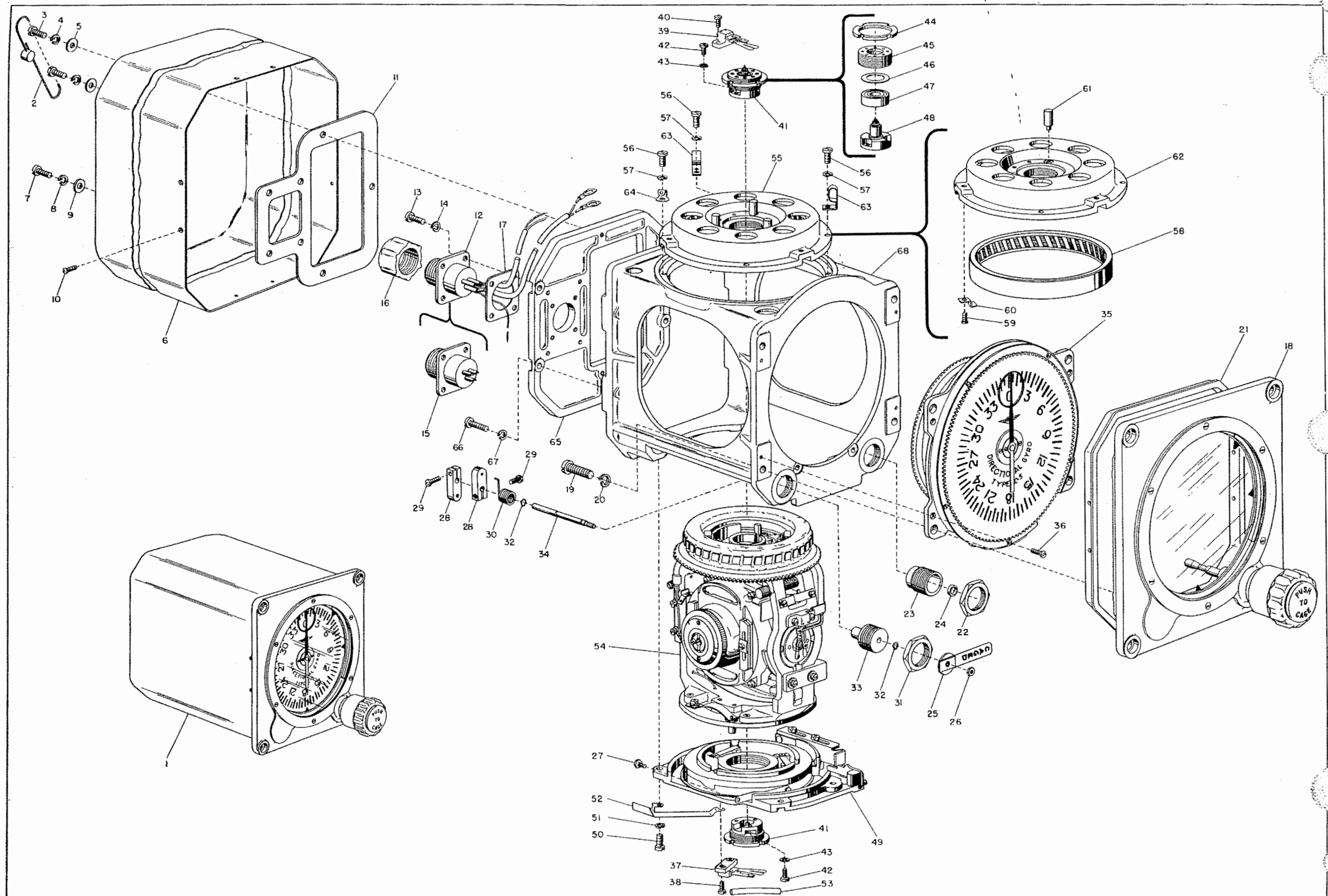


Figure 75. Type C-5 Directional Gyro Indicator Assembly

Revised 1 July 1953

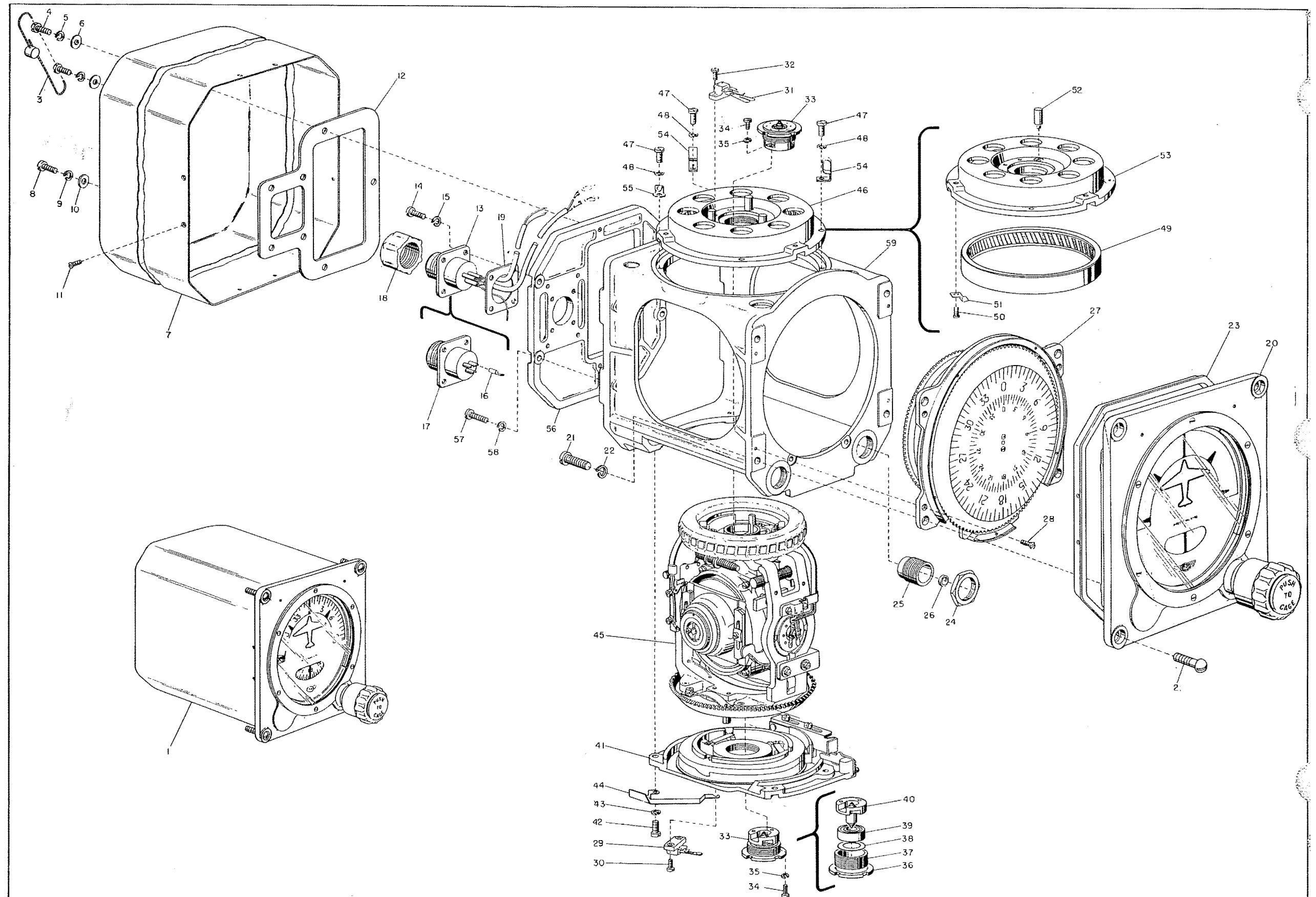
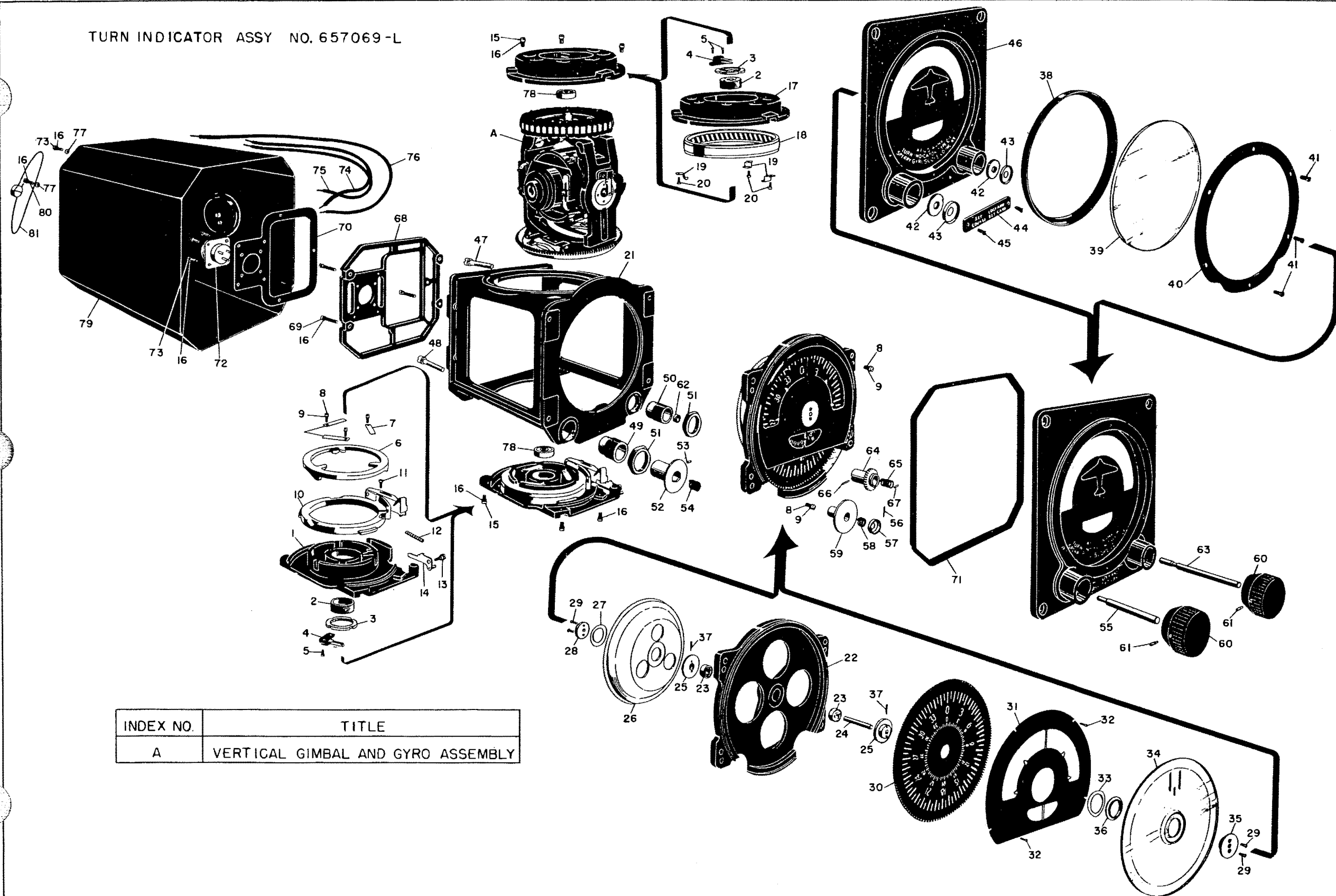


Figure 86. Directional Gyro Indicator Assemblies

TURN INDICATOR ASSY NO. 657069-L



INDEX NO.	TITLE
A	VERTICAL GIMBAL AND GYRO ASSEMBLY

Figure 48.

